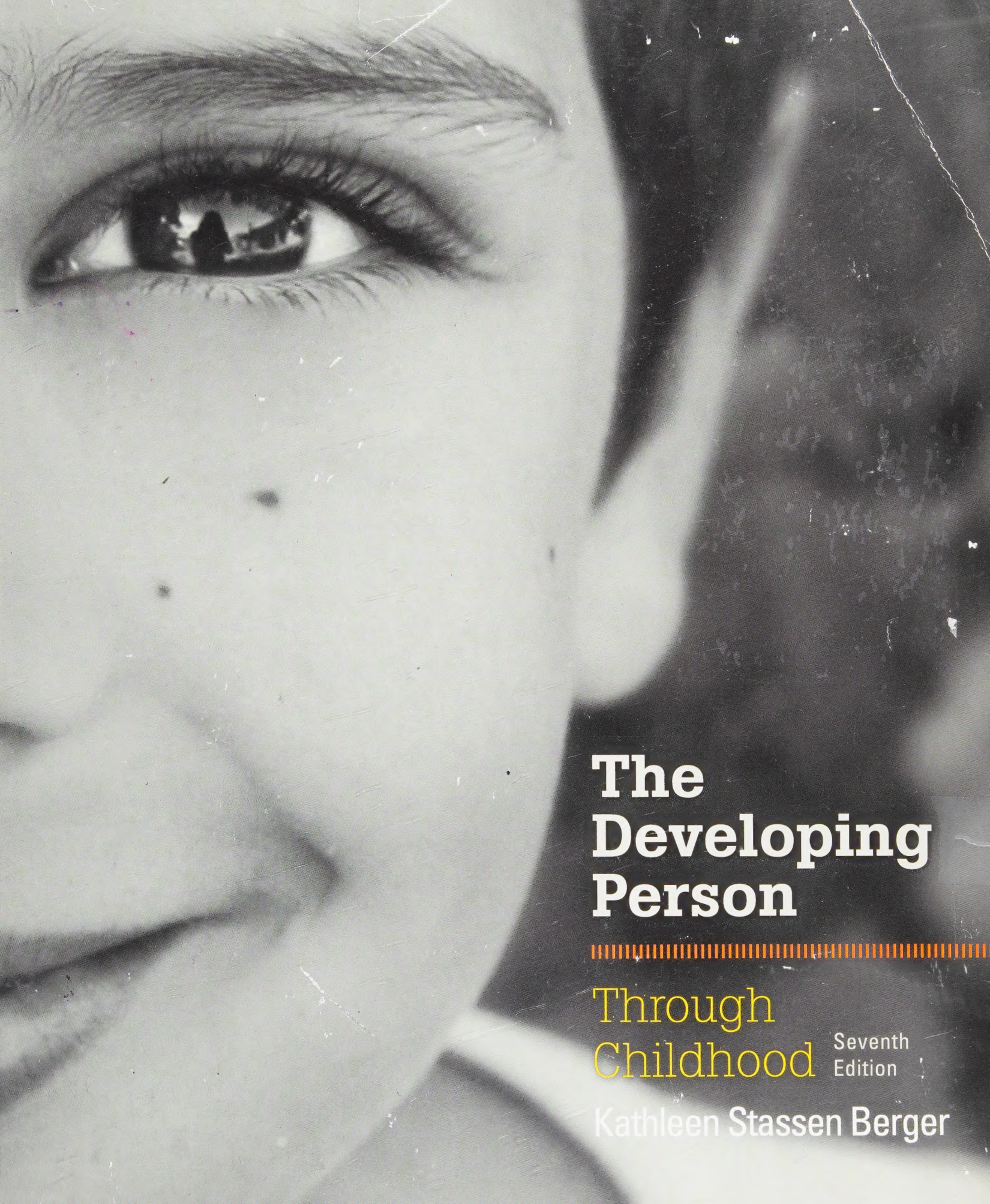


The Developing Person

Through Childhood

Seventh Edition

Kathleen Stassen Berger


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Highlights of the Science of Human Development

As evident throughout this textbook, much more research and appreciation of the brain, social context, and the non-Western world has expanded our understanding of human development in the twenty-first century. This timeline lists a few highlights of the past.

200,000–50,000 BCE With their large brains, long period of child development, and extensive social and family support, early humans were able to sustain life and raise children more effectively than other primates.

c. 400 BCE In ancient Greece, ideas about children from philosophers like Plato (c. 428–348 BCE) and Aristotle (384–322 BCE) influenced further thoughts about children. Plato believed children were born with knowledge. Aristotle believed children learn from experience.



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140 BCE In China, imperial examinations are one of the first times cognitive testing is used on young people.

500–1500 During the Middle Ages in Europe, many adults believed that children were miniature adults.



SCALA/ART RESOURCE, NY

1100–1200 First universities founded in Europe. Young people pay to be educated together.

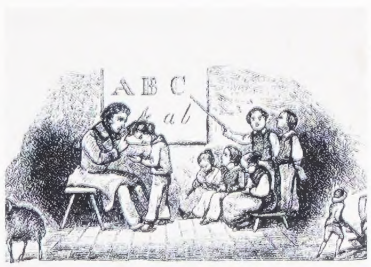
1650–1800 European philosophers like John Locke (1632–1704) and Jean-Jacques Rousseau (1712–1778) debate whether children are born as "blank slates" and how much control parents should take in raising them.



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1797 First European vaccination: Edward Jenner (1749–1823) publicizes smallpox inoculation, building on vaccination against smallpox in Asia, the Middle East, and Africa.

1750–1850 Beginning of Western laws regulating child labor and protecting the rights of children.



RALF HETTLER/GETTY IMAGES

1837 First kindergarten opens in Germany, part of a movement to teach young children before they entered the primary school system.

1859 Charles Darwin (1809–1882) publishes *On the Origin of Species*, sparking debates about what is genetic and what is environmental.



NICHOLAS VEASEY/GETTY IMAGES

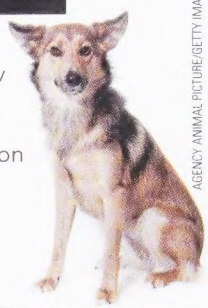
1879 First experimental psychology laboratory established in Leipzig, Germany.

1885 Sigmund Freud (1856–1939) publishes *Studies on Hysteria*, one of the first works establishing the importance of the subconscious and marking the beginning of the theories of psychoanalytic theory.



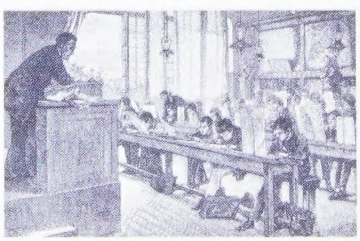
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1895 Ivan Pavlov (1849–1936) begins research on dogs' salivation response.



AGENCY ANIMAL PICTURE/GETTY IMAGES

1900 Compulsory schooling for children is established for most children in the United States and Europe.



RALF HETTLE/GETTY IMAGES

1903 The term "gerontology," the branch of developmental science devoted to studying aging, first coined.



FUSE/GETTY IMAGES

1905 Max Weber (1864–1920), the founder of sociology, writes *The Protestant Work Ethic*, about human values and adult work.

1905 Alfred Binet's (1857–1911) intelligence test published.

1907 Maria Montessori (1870–1952) opens her first school in Rome.



HARVEY WATTS PHOTOGRAPHY/GETTY IMAGES

1913 John B. Watson (1878–1958) publishes *Psychology As the Behaviorist Views It.*

1920 Lev Vygotsky (1896–1934) develops sociocultural theory in the former Soviet Union.

1923 Jean Piaget (1896–1980) publishes *The Language and Thought of the Child.*



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1933 Society for Research on Child Development, the preeminent organization for research on child development, founded.



1939 Mamie (1917–1983) and Kenneth Clark (1914–2005) receive their research grants to study race in early childhood.

JGI/JAMIE GRILL/GETTY IMAGES

50,000 BCE | 400 BCE | 0 | 500 | 1000 | 1500 | 1650 | 1700

1943 Abraham Maslow (1908–1970) publishes *A Theory of Motivation*, establishing the hierarchy of needs.

1950 Erik Erikson (1902–1994) expands on Freud's theory to include social aspects of personality development with the publication of *Childhood and Society*.



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1951 John Bowlby (1907–1990) publishes *Maternal Care and Mental Health*, one of his first works on the importance of parent–child attachment.



MONKEY BUSINESS IMAGES/SHUTTERSTOCK

1953 Publication of the first papers describing DNA, our genetic blueprint.



DIGITAL VISION VECTORS/GETTY IMAGES

1957 Harry Harlow (1905–1981) publishes *Love in Infant Monkeys*, describing his research on attachment in rhesus monkeys.



MARTIN ROGERS/GETTY IMAGES

1961 The morning sickness drug thalidomide is banned after children are born with serious birth defects, calling attention to the problem of teratogens during pregnancy.

1961 Alfred Bandura (b. 1925) conducts the Bobo Doll experiments, leading to the development of social learning theory.

1979 Urie Bronfenbrenner (1917–2005) publishes his work on ecological systems theory.

1986 John Gottman (b. 1942) founded the "Love Lab" at the University of Washington to study what makes relationships work.

1987 Carolyn Rovee-Collier (1942–2014) shows that even young infants can remember in her classic mobile experiments.





FOTOSEARCH/FOTOSEARCH/SUPERSTOCK

1990 The United Nations treaty *Convention on the Rights of the Child* in effect, requiring the best interests of children be considered. Children are no longer considered solely the possession of their parents. Currently all UN nations have signed on, except Somalia, South Sudan, and the United States.



TONGRO/GETTY IMAGES

1993 Howard Gardner (b. 1943) publishes *Multiple Intelligences*, a major new understanding of the diversity of human intellectual abilities. Gardner has since revised and expanded his ideas in many ways.

1800 | 1900 | 2000



ANYAIVANOVA/ISTOCK/THINKSTOCK

1953 B.F. Skinner (1904–1990) conducts experiments on rats and establishes operant conditioning.

1955 Emmy Werner (b. 1929) begins her Kauai study, which focuses on the power of resilience.



DONNA DAY/EXACTOSTOCK-1598/SUPERSTOCK

1956 K. Warner Schaie's (b. 1928) Seattle Longitudinal Study of Adult Intelligence begins.

1965 Head Start, an early-childhood-education program, launched in the United States.

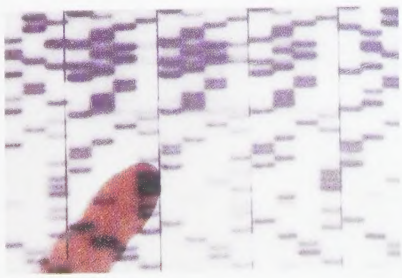
1965 Mary Ainsworth (1913–1999) starts using the "Strange Situation" to measure attachment.



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1966 Diana Baumrind (b. 1928) publishes her first work on parenting styles.

1972 Beginning of the Dunedin, New Zealand, study—one of the first longitudinal studies to include genetic markers.



TETRA IMAGES/GETTY IMAGES

1990–Present New brain imaging technology allows pinpointing of brain areas involved in everything from executive function to Alzheimer's disease.



BARIS SIMSEK/GETTY IMAGES

1990 Barbara Rogoff (b. 1950) publishes *Apprenticeship in Thinking*, making developmentalists more aware of the significance of culture and context. Rogoff provided new insights and appreciation of child-rearing in Latin America.

1994 Steven Pinker (b. 1954) publishes *The Language Instinct*, focusing attention on the interaction between neuroscience and behavior, helping developmentalists understand the need for physiological understanding as part of human growth. These themes continue in his later work, such as *How the Mind Works* in 1997.

1995–Present Onward. There are many more discoveries and research chronicled in this book.



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The Developing Person

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MARIA ABALOS/GETTY IMAGES

SEVENTH EDITION

The Developing Person

Through Childhood

Kathleen Stassen Berger

Bronx Community College
City University of New York

WORTH PUBLISHERS

A Macmillan Education Imprint
New York

Publisher: Rachel Losh

Associate Publisher: Jessica Bayne

Developmental Editors: Tom Churchill and Andrea Musick Page

Assistant Editor: Catherine Michaelsen

Executive Marketing Manager: Katherine Nurre

Supplements and Media Editor: Lauren Samuelson

Director, Content Management Enhancement: Tracey Kuehn

Managing Editor: Lisa Kinne

Production Editor: Betsy Draper, TSI evolve, Inc.

Project Liaison: Janice Stangel

Interior and Cover Design: Blake Logan

Photo Editors: Cecilia Varas and Bianca Moscatelli

Photo Researcher: Jacqui Wong

Art Manager: Matthew McAdams

Illustrations: Todd Buck Illustrations, MPS Limited, TSI evolve, Inc., Evelyn Pence

Production Managers: Stacey Alexander and Barbara Seixas

Composition: TSI evolve, Inc.

Printing and Binding: RR Donnelley

Cover Photograph: Maria Abalos/Getty Images

Library of Congress Preassigned Control Number: 2015933600

ISBN-13: 978-1-4641-4352-6

ISBN-10: 1-4641-4352-8

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Printed in the United States of America

Second printing

Worth Publishers

41 Madison Avenue

New York, NY 10010

www.worthpublishers.com

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About the Author

Kathleen Stassen Berger received her undergraduate education at Stanford University and Radcliffe College, then earned an MAT from Harvard University and an MS and PhD from Yeshiva University. Her broad experience as an educator includes directing a preschool, serving as chair of philosophy at the United Nations International School, and teaching child and adolescent development to graduate students at Fordham University in New York and undergraduates at Montclair State University in New Jersey and Quinnipiac University in Connecticut. She also taught social psychology to inmates at Sing Sing Prison who were earning their paralegal degrees.

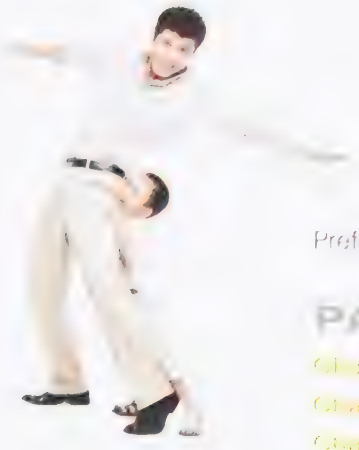
Currently, and for most of her professional career, Berger is a professor at Bronx Community College of the City University of New York, where she began as an adjunct in English and for the past decades has been a full professor in the Social Sciences department, which includes sociology, economics, anthropology, political science, human services, and psychology. She has taught introduction to psychology, child and adolescent development, adulthood and aging, social psychology, abnormal psychology, and human motivation. Her students—who come from many ethnic, economic, and educational backgrounds and who have a wide range of ages and interests—consistently honor her with the highest teaching evaluations.

Berger is also the author of *The Developing Person Through the Life Span* and *Invitation to the Life Span*. Her developmental texts are currently being used at more than 700 colleges and universities worldwide and are available in Spanish, French, Italian, and Portuguese, as well as English. Her research interests include adolescent identity, immigration, bullying, and grandparents, and she has published articles on developmental topics in the *Wiley Encyclopedia of Psychology* and in publications of the American Association for Higher Education and the National Education Association for Higher Education. She continues teaching and learning from her students as well as from her four daughters and three grandsons.



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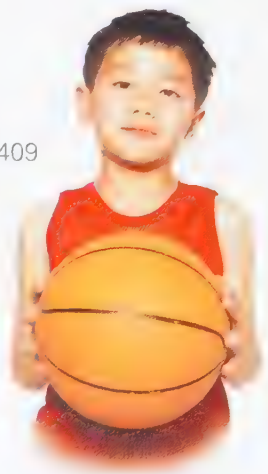
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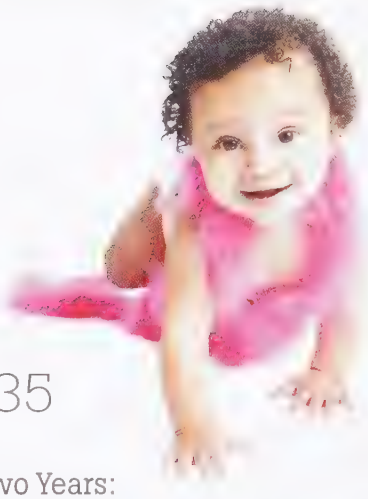
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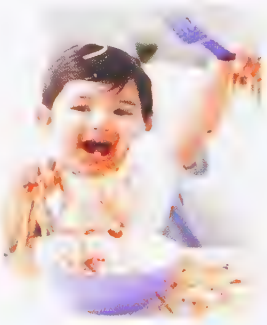
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Preface

My grandson, Asa, is in early childhood. He sees the world in opposites: male/female, child/grown-up, good guys/ bad guys. He considers himself one of the good guys, destroying the bad guys in his active imagination and in karate kicks in the air.

Oscar, his father, knows better. He asked me if Asa really believes there are good guys and bad guys, or is that just a cliché. I said that most young children believe in simple, straightforward opposites.

Undeterred, Oscar told Asa that he knows some adults who were once bad guys but became good guys.

"No," Asa insisted. "That never happens."

Asa is mistaken. As he matures, his body will grow taller and become better able to sit with feet on the floor, not kicking. His thoughts will include the idea that people change as they grow older, a theme throughout this book. What Asa says "never happens" occurs every day—none of us is a bad guy or a good guy, but all of us keep developing, ideally for the better.

Oscar is not alone in his awareness. Many folk sayings affirm development: People "turn over a new leaf," are "born-again"; parents are granted a "do-over" when they become grandparents; today is "the first day of the rest of your life." We recognize that the past never disappears and that parents always influence children, as in the saying "The apple does not fall far from the tree," but we also recognize many other genetic, biological, and social influences on each person, as detailed in the best-selling book *Far from the Tree* (Solomon, 2012).

The complexity, the twists and turns, the endless variety of the human experience at every age is fascinating to me, which is why I continue to study human development and revise this textbook, with new insights as well as new words and topics in every edition.

We all have echoes of Asa in us: We want life to be simple, for people to be good guys. But life is not simple. Learning about human development helps everyone respond to life's variations and influences, not with imaginary kicks but with wise responses. Knowledge does that. In a vivid example, Stephen Pinker (2011) finds that humans kill each other less now than they did in previous centuries; he cites education as one reason.

Education occurs in many ways. This textbook is only one of them—an aid to understanding the complexity of your life, my life, and the lives of all the estimated 19 billion humans alive now or who once lived. Nonetheless, although life experiences and thousands of other books add to our education, writing this text is my contribution and studying it is yours. Together we might learn how to limit the bad and increase the good in each of us as time goes on.


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Pondering My grandson, Asa, looks thoughtfully at his father, Oscar.

New Material

Every year, scientists discover and explain more concepts and research. The best of these discoveries are integrated into the text, including hundreds of new references on many topics—among them epigenetics at conception, prenatal protections, infant nutrition, autism spectrum disorders, attachment over the life span, high-stakes testing, drug use and drug addiction, sex education, and diversity of all

kinds (ethnic, economic, and cultural). Cognizant of the interdisciplinary nature of human development, I include recent research in biology, sociology, education, anthropology, political science, and more—as well as my home discipline, psychology.

Genetics and social contexts are noted throughout. The interaction of nature and nurture are discussed in many chapters, as neuroscience relates to research on family life. Among the many topics described with new research are the variations, benefits, and hazards of breast-feeding, infant day care, preschool education, single parenthood, and peer group pressures. Both my academic history and my human experience compel me to always note differences, deficits, and resilience.

New Pedagogical Aids

This edition incorporates learning objectives at the beginning of each chapter: The "What Will You Know?" questions indicate important ideas or provocative concepts—one for each major section of the chapter. After each major section, a medial summary repeats the main ideas of that section and then "What Have You Learned?" questions help students review what they have just read.

Learning Objectives

Much of what students learn from this course is a matter of attitude, approach, and perspective—all hard to quantify. Specific learning objectives arise from the "What Have You Learned?" questions, which now appear at the end of each major section rather than at the end of each chapter, as well as from the Key Terms that appear in bold in the text, defined in the margins, listed after each chapter and again in the glossary. You will notice that those Key Terms are repeated several times after they are defined, to reinforce learning and understanding.

Ideally, students will answer the learning objective questions in complete sentences, with specifics that demonstrate knowledge. Some items on the new lists are straightforward, requiring only close attention to the chapter content. Others require comparisons, implications, or evaluations. Cognitive psychology and research on pedagogy have shown that vocabulary, specific knowledge, and critical thinking are all part of learning. These features are designed to foster all three.



© GETTY IMAGES

Healthy? Children have high energy but small stomachs, so they enjoy frequent snacks more than big meals. Yet snacks are typically poor sources of nutrition.

New *Opposing Perspectives* Boxed Feature and Updated *A View from Science* and *A Case to Study* Features

We all need critical thinking skills. Virtually every page of this book presents not only facts but also questions with divergent interpretations. A new boxed feature called *Opposing Perspectives* appears in this edition of *The Developing Person Through Childhood and Adolescence* for the first time. This box focuses on exciting and controversial topics—from prenatal sex selection to e-cigarettes. I have tried to present information and opinions on both sides of an issue so that students can practice weighing evidence, assessing arguments, and coming to their own conclusions.

In addition, the boxes titled *A View from Science*, which explain surprising insights from recent scientific research, and *A Case to Study*, which illustrate developmental issues through the story of specific individuals, have been extensively updated. All these new features are included in the Table of Contents.

New Visualizing Development

Also new to this edition are full-page illustrations of key topics in development. Every chapter now includes an infographic display of data on key issues ranging from the biology of twin births to the milestones in the journey to emerging adulthood across the world. These illustrations combine global statistics, maps, charts, and photographs. Aware of the many modalities of learning, I have worked closely with noted designer Charles Yuen to use these infographics to reinforce key ideas.



BRITTA KASHOLM-PANOV/ GETTY IMAGES

Bonded That fathers enjoy their sons is not surprising, but notice the infant reaching for Dad's face. At this age, infants show their trust in adults by grabbing and reaching.

New Online Data Connections Activities

Understanding how we use data as developmentalists is an important part of what students learn in their courses. Data is a crucial part of understanding that developmental science is a science—and not just common sense. In this edition, I have created interactive activities based on important data from rates of breast-feeding to risk taking in adolescence. These are designed for students to be able to practice interpreting data.

For example, how do rates of breast-feeding differ by state across the United States and around the world, or how do rates of various risk-taking behaviors differ by gender or age during adolescence? These interactive activities are designed to engage students, make them more active learners, help them retain important material, and develop a deeper understanding of the quantitative data that we use in development. Instructors can assign these activities in the online LaunchPad that accompanies this book.

Child Development and Nursing Career Correlation Guides

Many students taking this course will be interested in future careers in nursing or early child development. This book and accompanying testing material are fully correlated to the NAEYC (National Association for the Education of Young Children) career preparation goals and the NCLEX (nursing) licensure exams.

Content Changes in the Tenth Edition

Child and adolescent development, like all sciences, builds on past learning. Many facts and concepts are scaffolds that remain strong over time: stages and ages, norms and variations, dangers and diversities, classic theories and fascinating applications. However, the study of development is continually changed by



KJ TTIG RF KIDS/ ALAMY

Family Pride Grandpa Charilaos is proud of his tavern in northern Greece (central Macedonia), but he is even more proud of his talented grandchildren, including Maria Soni (shown here). Note her expert fingering. Her father and mother also play instruments; is that nature or nurture?

discoveries and experiences, so no paragraph in this tenth edition is exactly what it was in the first edition, and only a few are exactly like the ninth.

Highlights of updates in the text appear below.

Part I. The Beginnings

1. Introduction

- New chapter opener on Professor Berger's experience at the birth of her grandson, Caleb, illustrates some of the reasons for the study of human development
- Discussion of the three domains of development brought forward in the chapter
- Differential susceptibility illustrated with example of children with a particular version of the serotonin transporter gene 5-HTTPLR
- Rationale for the shift by developmentalists from studying only the period of birth through adolescence to studying the entire life span explained in full
- The difference-equals-deficit error defined and discussed
- Expanded section on sexual orientation
- New *Opposing Perspectives* box considers use of the word *race*
- Plasticity now discussed in the context of the dynamic-systems approach
- New *A View from Science* box discusses the fear of a vaccination–autism link
- *Visualizing Development: Diverse Complexities*

2. Theories

- New chapter opener illustrates three aspects shared by all theories: (1) behavior can be surprising, (2) humans develop theories to explain everything, and (3) experience and culture matter
- A separate major section now devoted to discussion of each theory
- Classical conditioning illustrated by example of *white coat syndrome*
- Discussion of information processing expanded with inclusion of new insights from neuroscience, including photos comparing brain scans of healthy adults with those of adults who were diagnosed with ADHD as children
- Physical therapists' tailoring of treatment regimes to each patient used as an example of guiding someone through the zone of proximal development
- The introduction to the universal perspective (humanism and evolutionary theory) has been expanded
- In discussion of humanism: long-term effects on children whose parents did not have unconditional positive regard for them
- In discussion of evolutionary theory: a new subsection on evolution and culture
- *Visualizing Development: Breast-feeding Diversity*

3. The New Genetics

- Major sections reorganized for smoother information flow
- Expanded explanation of genes includes discussion of epigenetics
- In discussion of genetic variations: a new paragraph on *jumping* discusses transfer of some genetic material from one chromosome to the other when sperm and ova pair up
- New section on male/female differences in infertility
- Expanded section on IVF
- *Visualizing Development: One Baby or More*

4. Prenatal Development and Birth

- New chapter opener about the birth of Professor Berger's grandson illustrates constancies in prenatal development and birth as well changes in culture and context over time

- Section on the final three months of pregnancy reorganized to include subsections on organ maturation and the mother–child relationship
- Expanded section on cesarean delivery, including a paragraph on negative factors that appear months to years after birth
- Behavioral teratogens now discussed in a separate subsection
- New *A View from Science* box discusses conflicting advice given to pregnant women about their health and potential teratogens
- New subsection *What Do We Know?* raises questions about the state of our knowledge of teratogens and their effects
- Discussion of low birthweight now a separate major section
- New subsection on family bonding
- *Visualizing Development: A Healthy Newborn*

Part II. The First Two Years

5. The First Two Years: Biosocial Development

- *Failure to thrive* now discussed early in the chapter in explanation of percentile rankings
- New comparison of infants' sleep patterns in various cultures
- New figure (5.3) indicates percentage of co-sleeping infants in 14 countries
- New subsection on specialization of brain areas
- In section on brain development: a significantly expanded subsection on transient exuberance of dendrites and pruning
- Expanded introduction to the section on motor skills
- New subsection on dynamic sensory-motor systems in discussion of motor skills
- New *A Case to Study* box on SIDS
- *Visualizing Development: Nature, Nurture, and the Brain*

6. The First Two Years: Cognitive Development

- New chapter opener about Professor Berger's conversation with a dentist parallels steps in the development of infant cognition
- New *A View from Science* box explores insights from modern research about Piaget's stage theory
- fNIRS (functional near infrared spectroscopy) has been added to the list (and illustration) of techniques used by neuroscientists to understand brain function
- Revised and expanded introduction to information-processing theory
- In section on information processing: discussion of memory has been substantially reorganized and revised
- Research on the ability of infants of bilingual mothers ability to distinguish between the two languages has been added
- New research on cultural differences in what sounds infants prefer
- Discussion of *mean length of utterance (MLU)* as a measure of a child's language progress
- *Visualizing Development: Early Communication and Language Development*

7. The First Two Years: Psychosocial Development

- Chapter substantially reorganized: new major section *Brain and Emotions; The Development of Social Bonds* major section brought forward and now precedes the major section *Theories of Infant Psychosocial Development*
- Expanded discussion of infants' experience of fear
- *Growth of the Brain* section significantly revised: now includes discussion of how cultural differences are encoded in the brain as well as revised subsections on development of social impulses and on stress



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Proud Peruvian In rural Peru, an early-education program (Pronoei) encourages community involvement and traditional culture. Preschoolers, like this girl in a holiday parade, are proud to be themselves, and that helps them become healthy and strong.



Bliss for Boys But not for moms. Finger painting develops fine motor skills, which is part of the preschool curriculum in early childhood. This boy shows why most stay-home 3-year-olds miss out on this joy.

- Section on behaviorism and social learning now includes research showing that variations in proximal and distal parenting lead to variations in toddler behavior
- New sections on how humanism and evolutionary theory explain infant psychosocial development
- Section on infant day care substantially revised and reorganized; now includes a new *A View from Science: The Mixed Realities of Infant Day Care*
- *Visualizing Development: Developing Attachment*

Part III. Early Childhood

8. Early Childhood: Biosocial Development

- *Child Maltreatment* now a major section
- New research on nutrition, including long-term effects of childhood obesity
- Section on nutritional deficiencies revised and expanded
- Intellectual disability as a result of failure of the corpus callosum to develop
- Expanded section on stress hormones and their impact
- New *A View from Science: Eliminating Lead* includes illustration of the effects of lead exposure on the brain
- New subhead *Accuracy of State Data* discusses inconsistencies in how different states report child maltreatment
- New subsection presents new research on long-term impact of child maltreatment on development of social skills
- *Visualizing Development: Developing Motor Skills*

9. Early Childhood: Cognitive Development

- New chapter opener presents cognitive characteristics of a young child as exemplified in Professor Berger's conversation with her young grandson when he tried to convince her to play an imaginary basketball game
- Section on conservation and logic significantly revised with insights from recent research
- New *A Case to Study: Stones in the Belly* illustrates preoperational cognition
- New subsection *Overimitation* expands discussion in previous edition
- New subsection *STEM Learning* looks at Vygotsky's theory as it is applies to the current emphasis on STEM education
- Recent research on the naming explosion and fast-mapping
- *Visualizing Development: Early-Childhood Schooling*

10. Early Childhood: Psychosocial Development

- Section on protective optimism revised
- Introduction to major section *Play* revised and expanded
- Section on *Culture and Cohort* revised and expanded; includes figure showing time spent in various activities by children from four cultures/ethnicities
- Section on drama and pretending revised with new data on how much "screen time" young children have each day
- Section on gender development brought forward
- Section on moral development significantly reorganized and expanded
- *Visualizing Development: Less Play, Less Safe?*



No Toys Boys in middle childhood are happiest playing outside with equipment designed for work. This wheelbarrow is [illegible] ally because at any moment

Part IV. Middle Childhood

11. Middle Childhood: Biosocial Development

- *Special Education* now a major section
- New chapter opener highlights questions about parents' impact on a child's physical development
- New section on children's health habits
- New *A View from Science: What Causes Childhood Obesity?*

- New major section *Developmental Psychopathology* is a revised and reorganized treatment of issues around children with special needs, including a revised section on ADHD and drug treatments for children
- New *A Case to Study: Lynda Is Getting Worse* illustrates the difficulty in diagnosing psychopathologies
- New Figure 11.4 shows percentage of 6- to 17-year-olds medicated for emotional or behavioral difficulties during the last six months
- Dysgraphia added to the discussion of specific learning disorders
- New Figure 11.5 shows percentage of 3- to 21-year-olds with special educational needs in 1981, 2001, 2012
- *Visualizing Development: Childhood Obesity Around the Globe*

12. Middle Childhood: Cognitive Development

- Recent research added to the *Information Processing* section detailing how the ability to estimate magnitude (such as understanding the relative size of fractions) predicts later math proficiency
- Section on bilingual education brought forward
- Recent research on academic achievement that shows children have to internalize the positive expectations of teachers and parents for those expectations to motivate learning
- Recent research about the provision (or lack of provision) of arts education
- Section on international testing revised and expanded
- New research on changes in teachers' and state legislators' attitudes toward the Common Core (more negative)
- Second-language learning as an example of how policy affects education
- New section on ethnic diversity in U.S. schools
- *Visualizing Development: Education in Middle Childhood Around the World*

13. Middle Childhood: Psychosocial Development

- Social rejection as a cause and a consequence of feeling inferior
- Revised section on self-concept includes focus on the importance of social comparison
- New section *Culture and Self-Esteem* discusses what healthy self-esteem means in different cultures
- Revised section on two-parent families
- *Visualizing Development: A Wedding, or Not? Family Structures Around the World*



Girls Can't Do It As Vygotsky recognized, children learn whatever their culture teaches. Fifty years ago girls were in cooking and sewing classes. No longer. This 2012 photo shows 10-year-olds Kamrin and Caitlin in a Kentucky school, preparing for a future quite different from that of their grandmothers.

Ongoing Features

Many characteristics of this book have been acclaimed in every edition and continue to shine.

Writing That Communicates the Excitement and Challenge of the Field

An overview of the science of human development should be lively, just as real people are. Each sentence conveys tone as well as content. Chapter-opening vignettes bring student readers into the immediacy of development. Examples and explanations abound, helping students connect theory, research, and their own experiences.

Coverage of Brain Research

Inclusion of the exciting results from neuroscience is a familiar feature of this book. Brain development is the most obvious example: Every chapter includes a section on the brain, often enhanced with charts and photos. The following list highlights some of this material:

PET scans of brains of a depressed and a non-depressed person, p. 6; illustrated, p. 6
The three domains of development, p. 7; illustrated, p. 7
Critical periods of development, p. 16
Neuroscience and the limits of Piaget's developmental theory, pp. 48–49
Brain scans of adults with ADHD, pp. 49–50; illustrated, p. 49
Influence of copy number variations on basic brain structures, p. 84
Genetic counseling and psychological disorders, pp. 92–93
Prenatal growth of the brain, pp. 103–104; illustrated, p. 105
Teratogenic effects on brain development, pp. 113–114; illustrated, p. 114
Brain development in the first two years, pp. 142–147; illustrated, p. 144; p. 146
Experience-expectant and experience-dependent brain development, pp. 146–147
Factors that can harm brain development, pp. 148–151
Severe social deprivation: the case of Genie, p. 150
Brain immaturity and cross-modal perception, p. 159
A View from Science: Piaget and Modern Research, pp. 177–179
Techniques of infant brain scans, p. 179, illustrated, p. 178
Infant cognition: affordances and memory, pp. 181–186
Brain developments that support social emotions, pp. 204–205
The effect of the stress hormone cortisol on the developing brain, p. 204
Genetic influences on temperament, especially the combination of DRD4 VNTR and 5-HTTLPR genes, p. 211
Brain maturation and synchrony, pp. 213–214
Attachment and brain development, pp. 215–221; illustrated, p. 215; p. 216
Brain development in early childhood (prefrontal cortex, myelination, lateralization, the limbic system, stress and the brain), pp. 245–253; illustrated, p. 246 and p. 252
Abnormal growth of the corpus callosum and ADHD, p. 250
A View from Science: the effect of lead exposure on brain development, pp. 258–259
Consequences of maltreatment on brain development, p. 270
Maturation of the prefrontal cortex and theory of mind, pp. 287–288
Cultural differences in executive function among 5-year-olds, pp. 288–290
The influence of myelination of the limbic system and growth of the prefrontal cortex in development of emotional regulation, pp. 313–314
Preventing psychopathology by seeking emotional balance, p. 316
The effects of physical exercise on the brain, p. 353
Brain development in middle childhood, pp. 356–358
Neurological advances and selective attention, p. 357
Brain scans and intelligence, p. 360
Neurological scans confirm usefulness of information-processing approach, pp. 381–382
Memory capabilities by age, pp. 382–385
Development of control processes in middle childhood, pp. 384–385

Coverage of Diversity

Family Unity



Cultural variations in the time at which walking occurs, pp. 159–160
Cultural variations in infant mortality rates, pp. 161–162
A Case to Study: cultural variations in SIDS rates, pp. 162–163, illustrated, p. 162
Breast-feeding and HIV-positive women in Africa, pp. 165–166
International rates of stunting, pp. 167–168
Malnutrition: wasting in developing nations, pp. 167–168
Cultural and family differences in infants' exposure to language and language use, pp. 190–193
Understanding of emotional content of English by non-English speakers, p. 196
Separation anxiety and stranger wariness in Japan and Germany, pp. 205–206
Cultural differences in emotions encouraged in toddlers, pp. 206–207
Genetic and gender differences in infant/toddler temperament, p. 211
Ugandan mothers' contact-maintaining behaviors, p. 217
Influence of SES on attachment type, p. 219
Outcomes for Romanian orphans adopted by North American, European, and Australian families, p. 220
Gender differences in parental styles, pp. 221–223
Proximal and distal parenting in Cameroon and Greece, p. 226
International comparisons of infant day-care differences, pp. 230–233
Parental leave policies in selected countries, pp. 231–232, illustrated, p. 232
Differences in the corpus callosum between right- and left-handed people, p. 247
A View from Science: long-term symptoms of lead poisoning, p. 258
Chinese cultural views on artistic expression, p. 261
Culture and injury prevention, pp. 265–266
Study of overimitation in South Africa, Botswana, and Australia, pp. 283–284
Culture as a determinant of how one thinks and acts (social learning, Vygotsky), p. 284
Cultural differences in development of theory of mind, pp. 287–289
Bilingualism in various nations; ethnicity and bilingualism in the United States, pp. 295–296
English proficiency among U.S. children whose home language is not English, illustrated p. 295
Effects of intervention programs on low-SES children, pp. 303–305
Various cultures' goals for emotional regulation in young children, p. 315
Cultural differences in young children's play, pp. 319–320
Children's overexposure to gender and ethnic stereotypes as a result of too much screen time, p. 323
Cultural differences in caregiving styles, p. 326
Sex and gender differences, p. 327
Oedipus and Electra complexes, pp. 328–329
Influence of cultural norms on children, p. 330
Cultural differences in child discipline, pp. 337–338
Opposing Perspectives: cultural attitudes towards spanking, p. 338
Rates of childhood obesity around the world, illustrated, p. 352
A View from Science: childhood obesity in the United States by ethnicity; genetic propensity toward obesity and diabetes, pp. 353–355

Common leisure activities; impact on low-SES children, pp. 353–354
Childhood asthma and ethnicity in the United States, pp. 354–355, illustrated, p. 355
Cultural considerations in IQ testing, p. 360
Consideration of children with special needs, pp. 365–373
A Case to Study: difficulties in diagnosis of special needs, p. 365
Cultural differences (Vygotsky) and SES differences in school-age children's learning, pp. 379–381
Bilingual education, pp. 387–389
Academic achievement and SES, pp. 389–390
Parents' and teachers' expectations and academic achievement, pp. 390–391
Curriculum differences in various countries, pp. 392–395
Math and reading achievement in various countries, pp. 395–397, illustrated, p. 396
Gender differences in school performance, pp. 397–398
Children's second-language proficiency: Europe, Africa, Canada, the United States, p. 400
Ethnic diversity in U.S. public schools, pp. 403–405, illustrated, p. 403
Cultural differences in self-esteem in middle childhood, pp. 411–412
Children's reactions to stress in Louisiana (Hurricane Katrina), Sri Lanka (tsunami), and Sierra Leone (war and child soldiers), pp. 414–415
Family function within various structures, including families headed by same-sex couples, pp. 422–427
Rates of single parenthood around the world, illustrated, p. 423
Effects of SES on family structure and function, pp. 427–428
Shyness and popularity in North America and China, pp. 430–431
Gender differences in bullying, p. 432
Efforts to control bullying in various nations, p. 433
Age-related differences in moral reasoning, pp. 434–435
Gender differences in children's retribution/restitution behavior, pp. 437–438



©ISTOCK/GETTY IMAGE

Not Victims An outsider might worry that these two boys would be bullied, one because he is African American and the other because he appears to be disabled. But both are well liked for the characteristics shown here: friendliness and willingness to help and be helped.

Up-to-Date Coverage

My mentors welcomed curiosity, creativity, and skepticism; as a result, I am eager to read and analyze thousands of articles and books on everything from autism to zygosity. The recent explosion of research in neuroscience and genetics has challenged me, once again, first to understand and then to explain many complex findings and speculative leaps. My students continue to ask questions and share their experiences, always providing new perspectives and concerns.

Topical Organization Within a Chronological Framework

The book's basic organization has endured. Four chapters begin the book with coverage of definitions, theories, genetics, and prenatal development. These chapters provide a developmental foundation and explain the life-span perspective, plasticity, nature and nurture, multicultural awareness, risk analysis, gains and losses, family bonding, and many other basic concepts.

The other four parts correspond to the major periods of development. Each part contains three chapters, one for each of three domains: biosocial, cognitive, and psychosocial. The topical organization within a chronological framework is



Didn't Want to Marry This couple were happily cohabiting and strongly committed to each other but didn't wed until they learned that her health insurance would not cover him unless they were legally married.

a useful scaffold for students' understanding of the interplay between age and domain. The chapters are color-coded with tabs on the right-hand margins. The pages of the biosocial chapters have turquoise tabs, the cognitive chapters have blue tabs, and the psychosocial chapters have lime-green tabs.

Three Series of Integrated Features

Three series of deeper discussions appear as integral parts of the text where they are relevant. Readers of earlier editions will remember *A Case to Study* and *A View from Science*; new to this edition is the *Opposing Perspectives* feature. It is my belief that these features belong as part of the text, and hence they are placed exactly where they are relevant. I chose not to have separate chapters or boxes on diversity or abnormal development, because these topics are not discrete: They are integral to understanding every child.

End-of-Chapter Summary

Each chapter ends with a summary, a list of key terms (with page numbers indicating where the word is introduced and defined), and three or four application exercises designed to help students apply concepts to everyday life. Key Terms appear in boldface type in the text and are defined in the margins and again in a glossary at the back of the book. The outline on the first page of each chapter, the new learning objectives, and the system of major and minor subheads facilitate the survey-question-read-write-review (SQ3R) approach.

A "Summing Up" feature at the end of each section provides an opportunity for students to pause and reflect on what they've just read. Observation Quizzes inspire readers to look more closely at certain photographs, tables, and figures. The "Especially for . . . " questions in the margins, many of which are new to this edition, apply concepts to real-life careers and social roles.

Photographs, Tables, and Graphs That Are Integral to the Text

Students learn a great deal from this book's illustrations because Worth Publishers encourages authors to choose the photographs, tables, and graphs and to write captions that extend the content. The Online Data Connections further this process by presenting numerous charts and tables that contain detailed data for further study.

Supplements

After teaching every semester for many years, I know well that supplements can make or break a class. Students are now media savvy and instructors use many new tools. Many supplements are available for both students and professors.

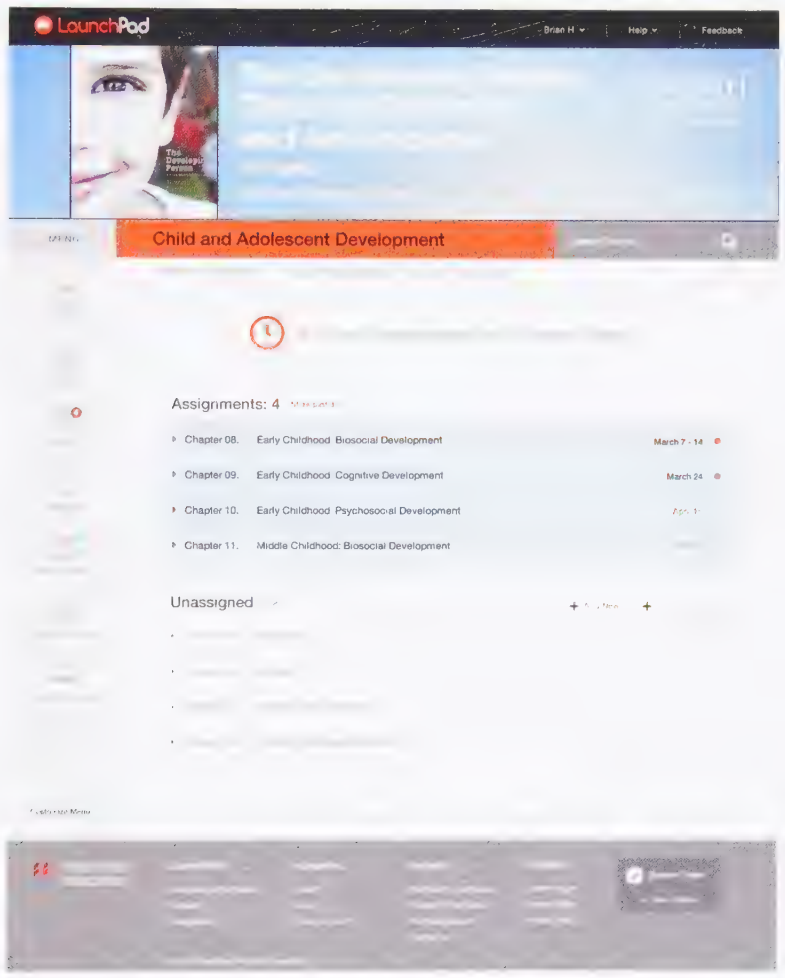
LaunchPad

A comprehensive web resource for teaching and learning, Worth Publishers' online course space offers:

- Prebuilt units for each chapter, curated by experienced educators, with relevant media organized and ready to be assigned or customized to suit your course
- One location for all online resources, including an interactive e-Book, LearningCurve's adaptive quizzing (see below), videos, activities, and more

- Intuitive and useful analytics, with a gradebook that lets you track how students in the class are performing individually and as a whole
- A streamlined and intuitive interface that lets you build an entire course in minutes

The LaunchPad can be previewed at www.macmillanhighered.com/launchpad/bergerca10e



LearningCurve

The **LearningCurve** quizzing system reflects the latest findings from learning and memory research. LearningCurve's adaptive and formative quizzing provides an effective way to get students involved in the coursework. It combines:

- A unique learning path for each student, with quizzes shaped by each individual's correct and incorrect answers
- A personalized study plan, to guide students' preparation for class and for exams
- Feedback for each question with live links to relevant e-Book pages, guiding students to the resources they need to improve their areas of weakness

The LearningCurve system combines adaptive question selection, immediate feedback, and an interactive interface to engage students in a learning experience

that is unique to them. Each LearningCurve quiz is fully integrated with other resources in LaunchPad, so students will be able to review using Worth's extensive library of videos and activities. And state-of-the-art question-analysis reports allow instructors to track the progress of individual students as well as their class as a whole.

A team of dedicated instructors—including Diana Riser, Columbus State University, Carolyn Ensley, Wilfrid Laurier University, Jim Cuellar, Indiana University, Bloomington; Lisa Hager, Spring Hill College; Jessica Herrick, Mesa State College; Sara Lapsley, Simon Fraser University; Rosemary McCullough, Ave Maria University; Wendy Morrison, Montana State University; Emily Newton, University of California, Davis; Curtis Visca, Saddleback College; and Devon Werble, East Los Angeles Community College—have worked closely to develop more than 5,000 quizzing questions developed specifically for this book.

You'll find the following in our LaunchPad:

Human Development Videos

In collaboration with dozens of instructors and researchers, Worth has developed an extensive archive of video clips. This collection covers the full range of the course, from classic experiments (like the Strange Situation and Piaget's conservation tasks) to investigations of children's play to adolescent risk-taking. Instructors can assign these videos to students through LaunchPad or choose one of 50 popular video activities that combine videos with short-answer and multiple-choice questions. For presentation purposes, our videos are available in a variety of formats to suit your needs, and highlights of the series appear periodically in the text's margin.

Instructor's Resources

Now fully integrated with LaunchPad, this collection of resources written by Richard O. Straub (University of Michigan, Dearborn) has been hailed as the richest collection of instructor's resources in developmental psychology. The resources include learning objectives, springboard topics for discussion and debate, handouts for student projects, course-planning suggestions, ideas for term projects, and a guide to audiovisual and online materials.

Interactive Presentation Slides

A new, extraordinary series of "next-generation" interactive presentation lectures gives instructors a dynamic yet easy-to-use new way to engage students during classroom presentations of core developmental psychology topics. Each lecture provides opportunities for discussion and interaction and enlivens the psychology classroom with an unprecedented number of embedded video clips and animations from Worth's library of videos. In addition to these animated presentations, Worth also offers a set of prebuilt slide sets with all chapter art and illustrations. These slides can be used as is, or they can be customized to fit individual needs.

Test Bank and Computerized Test Bank

The test bank, prepared by Jillene Seiver (Bellevue College) includes at least 100 multiple-choice and 70 fill-in-the-blank, true-false, and essay questions for each chapter. Good test questions are critical to every course, and we have gone through each and every one of these test questions with care. We have added more challenging questions, and questions are keyed to the textbook by topic, page number, and level of difficulty. Questions are also organized by NCLEX, NAEYC, and APA

goals and Bloom's taxonomy. We have also written rubrics for grading all of the short-answer and essay questions in the test bank.

The Diploma computerized test bank guides instructors step by step through the process of creating a test. It also allows them to quickly add an unlimited number of questions; edit, scramble, or resequence items; format a test; and include pictures, equations, and media links. The accompanying gradebook enables instructors to record students' grades throughout the course and includes the capacity to sort student records, view detailed analyses of test items, curve tests, generate reports, and add weights to grades.

Thanks

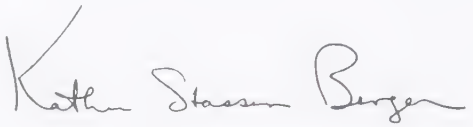
I'd like to thank the academic reviewers who have read this book in every edition and who have provided suggestions, criticisms, references, and encouragement. They have all made this a better book. I want to mention especially those who have reviewed this edition:

Phyllis Acadia, *Capella University*
Sandra Barrueco, *The Catholic University of America*
Tracy Bartel, *Chatham University*
Patricia Bellas, *Irvine Valley College*
Joanne Benjamin, *San Diego City College*
Kate Byerwalter, *Grand Rapids Community College*
Katherine Cloutier, *Michigan State University*
Julia Conrad, *Colorado Mountain College-West Garfield Campus*
Bret Cormier, *Kentucky State University*
Jennifer Cuddapah, *Hood College*
Linda Fayard, *Mississippi Gulf Coast Community College*
Christine Feeley, *Suffolk County Community College*
Phil Freneau, *College of the Redwoods*
Megan Geerdts, *Rutgers University*
Kim Glackin, *Metropolitan Community College-Blue River*
April Grace, *Madisonville Community College*
Misty Hicks, *Missouri State University*
Christine Hodges, *Coastal Carolina University*
Erica Holt, *Germanna Community College*
Christie Kaaland, *Antioch University*
Carol Kessler, *Cabrini College*
Donna Lutz, *Hofstra University*
Elisa Magidoff, *Canada College and Skyline College*
Christopher Magnuson, *Ottawa University*
Martha Mendez-Baldwin, *Manhattan College*
Mary Beth Miller, *Fresno City College*
Mary O'Boyle, *Northeast Community College*
Krista Paduchowski, *University of Massachusetts-Lowell*
Doug Pearson, *Normandale Community College*
John Prange, *Irvine Valley College*
Robert Sasse, *Palomar College*
Joseph Schroer, *Miami University-Ohio*
Alex Schwartz, *Santa Monica College*
Delar K. Singh, *Eastern Connecticut State University*
Jay Slosar, *Chapman University*
Sheila Smith, *Foothill College*
Randall Stiles, *University of Nevada-Las Vegas*
Michael Streppa, *Montreat College*
Michelle Wright, *DePaul University*

In addition, I wish to thank the instructors who participated in our survey. We've tried to apply the insights gained from their experiences with the last edition to make this new edition even better.

Andreea DiLorenzo, *Monmouth University*
Linda Fayard, *Mississippi Gulf Coast Community College*
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The editorial, production, and marketing people at Worth Publishers are dedicated to meeting the highest standards of excellence. Their devotion of time, effort, and talent to every aspect of publishing is a model for the industry. I particularly would like to thank Stacey Alexander, Jessica Bayne, Tom Churchill, Betsy Draper, Lisa Kinne, Blake Logan, Bianca Moscatelli, Andrea Musick Page, Tracey Kuehn, Catherine Michaelsen, Katherine Nurre, Felicia Ruocco, Lauren Samuelson, Barbara Seixas, and Cecilia Varas.



New York, January 2015

Dedication

Finally, I wish to dedicate this edition to my brother, Glen Harold Stassen, a dedicated professor and author, as well as my beloved only sibling. My plan was to reach old age with him, but he died in 2014.

The Developing Person

Through Childhood



the beginnings

The science of human development includes many beginnings. Each of the first four chapters of this text forms one corner of a solid foundation for our study.

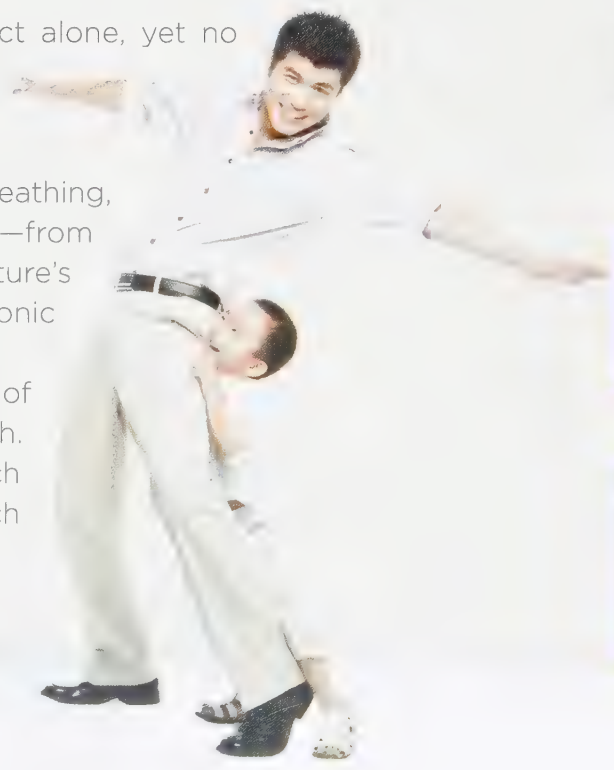
Chapter 1 introduces definitions and dimensions, explaining research strategies and methods that help us understand how people develop. The need for science, the power of culture, and the necessity of an ecological approach are all explained.

Without ideas, our study would be only a jumble of observations. Chapter 2 provides organizing guideposts: Five major theories, each leading to many other theories and hypotheses, are described.

Chapter 3 explains heredity. Genes never act alone, yet no development—whether in body or brain, at any time, in anyone—is unaffected by DNA.

Chapter 4 details the prenatal growth of each developing person from a single cell to a breathing, grasping, crying newborn. Many circumstances—from the mother's diet to the father's care to the culture's values—affect development every day of embryonic and fetal growth.

As you see, the science and the wonder of human life begin long before the first breath. Understanding the beginnings described in each of these chapters prepares us to understand each developing child, and each of us.





CHAPTER 1

Introduction



What Will You Know?

1. How can the study of children, each one unique, be a science?
2. Does his or her ethnic group make any difference in a child's development?
3. Is childhood today different from childhood fifty years ago?
4. How can we know what changes between one year of life and the next?
5. Do scientists always investigate the crucial questions?

- Understanding How and Why
  - The Need for Science
  - The Nature–Nurture Controversy
  - The Three Domains
  - Childhood and Adulthood
- Including All Kinds of People
  - Difference or Deficit?
  - Culture, Ethnicity, and Race
  - OPPOSING PERSPECTIVES: Using the Word *Race*
  - Socioeconomic Status
  - Finding the Balance
- As Time Goes On
  - Critical Periods
  - Ecological Systems
  - Plasticity
  - A CASE TO STUDY: Plasticity and David
- Using the Scientific Method
  - Observation
  - The Experiment
  - The Survey
  - Studying Development over the Life Span
- Cautions and Challenges from Science
  - Correlation and Causation
  - A VIEW FROM SCIENCE: Vaccination and Autism
  - Ethics
  - Science as a Way to Help Humankind

As [illegible] daughter's bent right leg in place with all my strength. A nurse holds her left leg while the midwife commands, "Push—push—push." Finally, a head is visible, small and wet, but perfect. In a moment, body and limbs emerge—all 4,139 grams of Caleb, perfect as well. Every number on the monitor is good, and my new grandson breathes and moves as a healthy newborn should. Bethany, smiling, begins to nurse.

Then miracle makes celestial music ring in my ears. The ringing grows louder. Bethany shimmers, then the room grows dark. Suddenly, I am on the floor, looking up at six medical professionals. I have fainted.

I am fine. I insist, scrambling back onto the couch where I spent the night. Six people stare down at me.

"You need to go to triage," one says.

"No. I am fine. Sorry I fainted."

"We must send you to triage in a wheelchair."

What can I say to make them ignore me and focus on Bethany and Caleb?

"You can refuse treatment," a nurse tells me.

Oh yes, thank you, the law now requires patient consent.

I am wheeled down to "admitting." I explain that I was with my laboring daughter all night with no food or sleep. I refuse treatment.

The admitting nurse takes my blood pressure—normal—and checks with her supervisor. She lets me return before the placenta is delivered.

I am thankful, but puzzled. As a developmental scholar and author, I understand birth, numbers, jargon, monitors, body language, medical competence, hospital cleanliness, hall noises, and more. I do not panic. I knew that Bethany was strong and



COURTESY KATHLEEN BERGER

Born Blissful One of us rests after an arduous journey, and the other rejoices after crying and fainting.

healthy, and every prenatal visit confirmed a healthy fetus. I was grateful, but not surprised, that all was well.

I told the triage nurse that I had not slept or eaten all night—true, but I had done that before, never fainting. Why this time?

This incident is a fitting introduction for Chapter 1, which begins to explain what we know, what we don't know, and how we learn about human development. For me and other scientists, and also for you and everyone else, unexpected moments occur as each life is lived. Emotions mix with intellect, family bonds with professional competence, contexts with cultures, personal experiences with academic knowledge, generalities with exceptions.

Many details of Caleb's arrival were unlike birth in other cultures and eras. Yet other aspects have always been part of the human experience. This chapter, and those that follow, will help you understand the specifics and the universals of development.

Understanding How and Why

science of human development The science that seeks to understand how and why people of all ages and circumstances change or remain the same over time.

The **science of human development** *seeks to understand how and why people—all kinds of people, everywhere, of every age—change over time.* The goal of this science is to help Earth's 7 billion people fulfill their potential.

Each aspect of this definition above merits explanation.

The Need for Science

Developmental study is a *science.* It depends on theories, data, analysis, critical thinking, and sound methodology, just like every other science. All scientists ask questions and seek answers in order to ascertain "how and why." In this process, scientists gather evidence on whatever they are studying, be it chemical elements, rays of light, or, here, child behavior.

One hallmark of the science of human development is that it is interdisciplinary; that is, scientists from many academic disciplines (biology, psychology, sociology, anthropology, economics, and history among them) contribute to our understanding of how and why people grow.

Science is especially useful when we study children: Lives depend on it. What should pregnant women eat and drink? How much should babies cry? When and how should children be punished? What should 5-year-olds learn? Should they learn in school or at home? Through required memorization or free play? About God or about algebra?

People have disagreed about almost every question in child development—often vehemently, sometimes violently. Some parents beat their children; others imprison such parents. Some parents sacrifice vast sums to send their children to schools that others abhor. Science informs, guides, and redirects those on all sides of every dispute.

The Scientific Method

scientific method A way to answer questions using empirical research and data-based conclusions.

theory A comprehensive set of ideas.

hypothesis A specific prediction that can be tested.

empirical Based on observation, experience, or experiment; not theoretical.

To discard unexamined opinions and to rein in personal biases, we follow the five steps of the **scientific method** (see Figure 1.1):

1. *Begin with curiosity.* On the basis of **theory,** prior research, or personal observation, pose a question.
2. *Develop a hypothesis.* Shape the question into a **hypothesis,** a specific prediction to be examined.
3. *Test the hypothesis.* Design and conduct research to gather **empirical** evidence (data).


1. Curiosity


2. Hypothesis


3. Test


4. Analyze data and draw conclusions


5. Report the results

4. *Analyze data and draw conclusions.* Determine whether the evidence supports the hypothesis.
5. *Report the results.* Share the data, procedures, statistics, conclusions, and alternative explanations.

FIGURE 1.1
Process, Not Proof Built into the scientific method—in questions, hypotheses, tests, and replication—is a passion for possibilities, especially unexpected ones.

The Need for Replication

As you see, scientists begin with curiosity and then seek the facts, drawing conclusions only after careful research. **Replication**—repeating the procedures and methods of a study with different participants—may be a final step (Jasny et al., 2011). Scientists learn from each other, building on what has gone before. They hesitate to draw conclusions or to believe the results of others' research until replication has occurred—although often the media broadcast surprising findings before replication.

replication Repeating a study, usually using different participants.

This method is not foolproof. Scientists sometimes draw conclusions too quickly, misinterpret data, or ignore alternative perspectives, as discussed at the end of this chapter. Something that is valid for one group of children in one time and place may not be valid elsewhere or in another time. Scientists continually refine methods, question the conclusions drawn by others, and occasionally discover—to their shock and horror—that another scientist has not followed the procedures outlined above. Replication is needed to verify conclusions.

Always, however, asking questions and testing hypotheses by gathering data is the foundation of science; always, scientists seek facts, not untested assumptions.

The Nature–Nurture Controversy

A great puzzle of development—the *nature–nurture debate*—is an easy example of the need for science. **Nature** refers to the influence of the genes that people inherit. **Nurture** refers to environmental influences, which begin with the health and diet of the embryo's mother and continue lifelong, including the impacts of family, school, community, and culture.

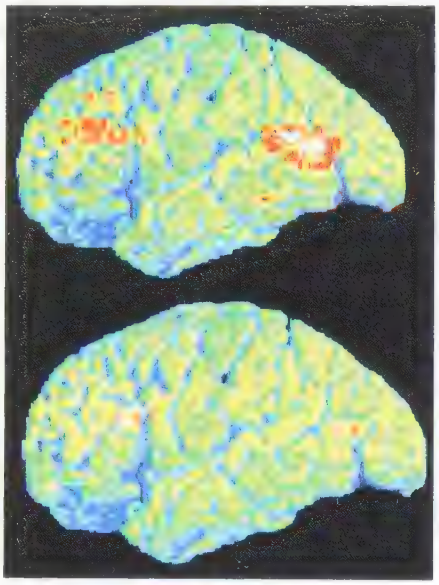
nature In development, nature refers to the traits, capacities, and limitations that each individual inherits genetically from his or her parents at the moment of conception.

nurture In development, nurture includes all the environmental influences that affect the individual after conception. This includes everything from the mother's nutrition while pregnant to the implicit values of the nation.

The nature–nurture debate has many other names, among them *heredity–environment* and *maturation–learning*. Under whatever name, the basic question is: *How much of any characteristic, behavior, or emotion is the result of genes, and how much is the result of experience?*

Some people believe that most traits are inborn, that children are innately good ("an innocent child") or bad ("beat the devil out of them"). Others stress nurture, crediting or blaming parents, neighborhoods, drugs, or even food when someone is good or bad, a hero or a criminal.

Neither belief is accurate. The question is "how much," not "which," because both genes and the environment affect every characteristic: Nature always affects nurture, and then nurture affects nature. Even "how much" is misleading if it implies that nature and nurture each contribute a fixed amount (Eagly & Wood, 2013; Lock, 2013).



WEILL CORNELL MEDICINE/NEW YORK PRESBYTERIAN HOSPITAL/SCIENCE SOURCE

Red Means Stop At top, the red areas on this PET scan show abnormally low metabolic activity and blood flow in a depressed person's brain, in contrast to the normal brain at bottom. Neuroscience confirms that depression is biological, not just psychological.

differential susceptibility The idea that people vary in how sensitive they are to particular experiences. Often such differences are genetic, which makes some people affected "for better *and* for worse" by life events. (Also called *differential sensitivity*.)

A complex nature–nurture interaction is apparent in every moment of our lives, as is evident in the opening vignette of this chapter. I fainted at Caleb's birth because of at least ten factors (age, air quality, exhaustion, exertion, gender, hormones, joy, low blood sugar, memory, relief), each influenced by both nature and nurture. The combination, and no single factor, landed me on the floor.

Some People Are Vulnerable

Each aspect of nature and nurture depends on other aspects of nature and nurture, in ways that vary for each individual (Manuck & McCaffery, 2014). For instance, the negative impact of a beating, or of any other experience, might be magnified because of the particular versions of genes that a person has. The opposite is true as well: Some genes are protective, making people less vulnerable to difficult or traumatic experiences. Similarly, differences in nurture can either protect against or worsen the impact of a person's genetic make-up.

For example, some people inherit genes (nature) for diabetes but never get that disease because nurture (in this case, diet and exercise) protects them. Or a person could be overweight and sedentary (both risk factors for diabetes and many other ailments) but never become diabetic because their genes buffer the effects of their habits.

Sometimes protective factors, in either nature or nurture, outweigh liabilities. As one review explains, "there are, indeed, individuals whose genetics indicate exceptionally high risk of disease, yet they never show any signs of the disorder" (Friend & Schadt, 2014, p. 970).

This is called **differential susceptibility** (or differential sensitivity)—that is, how sensitive a person is to any particular environmental experience differs from one person to another because of the particular genes each person has inherited. Some people are like dandelions—hardy, growing and thriving in good soil or bad, with or without ample sun and rain. Other people are like orchids—quite wonderful, but only when ideal growing conditions are met (Ellis & Boyce, 2008; Laurent, 2014).

For example, in one study, depression in pregnant women was assessed and then the emotional maturity of their children was measured. Those children who had a particular version of the serotonin transporter gene (5-HTTLPR) were likely to be emotionally immature if their mothers had been depressed, but *more* mature than average if their mothers had not been depressed (Babineau et al., 2014).

The Baby with Colic

An example of differential susceptibility comes from the 10 to 20 percent of all infants who cry for hours at a time in the first 3 months of life, presumably as a result of genes. They are said to have colic, and their frustrated parents cannot comfort them (J.S. Kim, 2011).

A colicky baby is like an orchid, and future development depends on nurture. For some, their inconsolable crying makes the parents unusually responsive. Then the children become better than average (more outgoing, generous, high-achieving) when they outgrow their early difficulties. Other naturally difficult orchids provoke parental anger, or even rejection, the effects of which last long after the colic has subsided. They become low-achieving, unhappy children.

One study of colicky babies confirms that parents react in many ways (Landgren et al., 2012). One mother said:

> There were moments . . . when she was apoplectic and howling so much that I almost got this thought, 'now I'll take a pillow and put it over her face just until she quietens down, until the screaming stops.'

By contrast, another mother said:

> In some way, it made me stronger, and made my relationship with my son stronger. . . . Because I felt that he had no one else but me. 'If I can't manage, no one can.' So I had to cope.

As two developmental experts explain:

> Differential susceptibility implies . . . that it may be mistaken to regard some children—like highly negative infants—as simply more vulnerable to the negative effects of adversity. And this is because such children may also benefit more than others from environmental support and enrichment.
>
> *[Belsky & Pluess, 2012, p. 3]*

These experts find that genetic vulnerability (in this case, the DRD4 gene) does not disappear. During adolescence even well-nurtured orchids are more rebellious and impulsive than the less temperamental dandelions, but nurture always affects nature.

The specifics of differential susceptibility require complex and extensive empirical data, as thousands of scientists seeks to understand exactly how nature and nurture interact to produce each particular human trait with each version of each gene. But the simple conclusion remains: Neither genes nor upbringing alone make a child amazingly good or incredibly bad (Masten, 2014). Both nature and nurture matter.

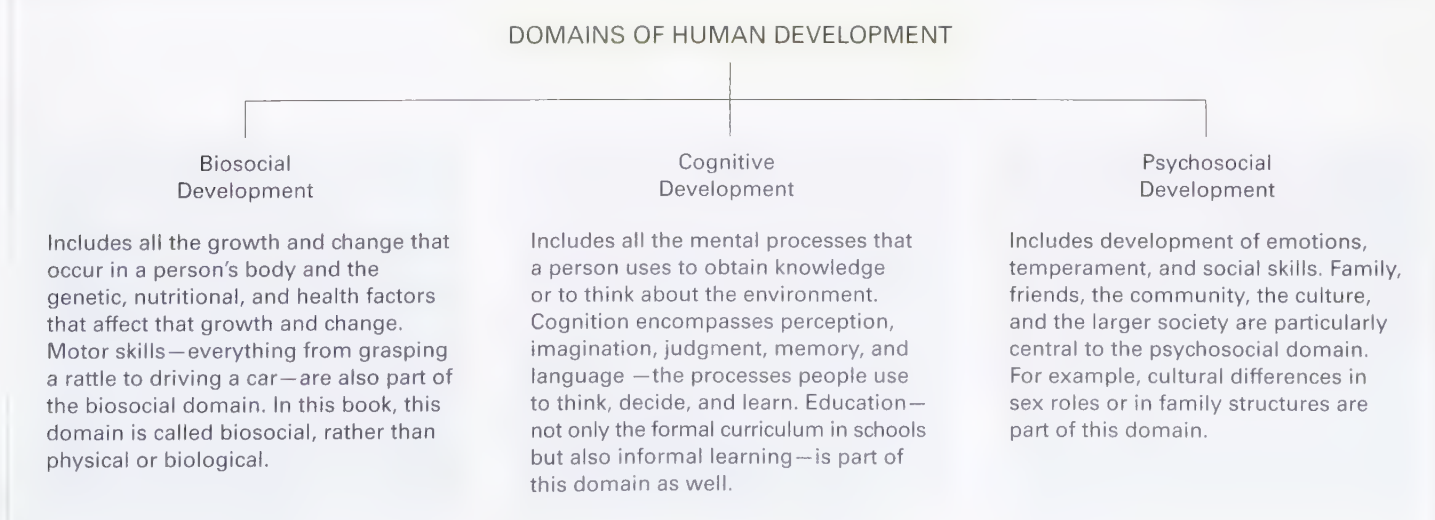
The Three Domains

Obviously, it is impossible to examine nature and nurture on every aspect of human development at once. Typically therefore, individual scientists study one characteristic at a time. A century ago, physical development (such as tooth eruption or running speed) was the main focus of developmental research, but scientists now realize that not only the body but also the intellect and emotions develop throughout life. To understand the whole person, an interdisciplinary approach to human development has replaced the old silo approach of the past.

To make it easier to study, development is often considered in three domains—*biosocial*, *cognitive*, and *psychosocial*. (Figure 1.2 describes each domain.) Each domain includes several academic disciplines: The biosocial includes biology,

FIGURE 1.2

The Three Domains The division of human development into three domains makes it easier to study, but remember that very few factors belong exclusively to one domain or another. Development is not piecemeal but holistic: Each aspect of development is related to all three domains.



neuroscience, and medicine; the cognitive includes psychology, linguistics, and education; and the psychosocial includes economics, sociology, and history. Typically, each scholar follows a particular thread within one domain, using clues and conclusions from other scientists who have concentrated on that same thread.

However, since every person is a whole tapestry of multi-colored threads, every aspect of growth is biopsychosocial, touching on all three domains. For example, babies start speaking because of maturation of the brain, mouth, and vocal cords (*biological*), which allows them to express connections between objects and words (*cognitive*), which could not occur unless people talked to them (*psychosocial*).

This constant interaction of domains presents a problem: Words and pages follow in sequence and the mind thinks one thought at a time. That makes it impossible to describe or grasp all domains simultaneously. The scientific method weaves disparate threads together, as evidence-based conclusions from many sources advance our understanding of the whole person.

Childhood and Adulthood

Are children more important than adults? For decades, because the focus of developmentalists was on physical growth, the answer to this question was yes. Consequently, the study of human development was the study of child development, with a nod to the physical declines of old age. That produced, as a famous critic described, "a curiously broken trajectory of knowledge . . . [with] a brave beginning, a sad ending, and an empty middle (Bronfenbrenner, 1977, p. 525).

Since people were not thought to develop over the years of adulthood, developmentalists did not study adults. The opposing giants of developmental theory, Sigmund Freud and Jean Piaget, agreed on one thing: The final stage of development began in early adolescence and then continued without significant change until death.

Recently, however, that empty middle has been filled. Scientists now gather data about adulthood, discovering many developmental changes. For example, sexual appetites, cognitive perspectives, and employment attitudes all change markedly from ages 15 to 65.

No one now thinks that development stops at age 15. Although many scholars still focus on one part of the lifespan, every developmentalist considers what happened before, and what will happen after, each particular period. For instance, one influential scholar believes infancy is "the foundation and catalyst of human development" (Bornstein, 2014, p. 121). In other words, he studies infancy to understand the rest of life.

Is childhood more important, influential, and determinative than adulthood? If a person is, say, malnourished from age 30 to 33, is that as harmful as if that same person had been malnourished from birth to age 3? The answer to that specific question is no. Neuroscientists have proven that early malnutrition can stunt brain growth and have long-lasting effects far worse than those of later malnutrition.

But scientists are not certain about the cognitive and psychosocial domains. If you had to choose only one developmental period in which to invest billions of education dollars, should you choose preschools or colleges? Or if you were a psychologist who wanted to treat people who would benefit most, would they be children or adults?

The answer is not obvious. Some research suggests that the first years of life are the most crucial for intellectual or emotional development, but other research finds the opposite: Educating parents, or even grandparents, may be the best way to help children. Some researchers find that the adolescent years are more pivotal for later development than those of early childhood (Falconi et al., 2014).

Political debates need solid data. Should the U.S. Congress protect fetuses and infants (e.g., WIC, mother/infant food supplements), or preschoolers (e.g. Head Start), or older children (e.g., public schools), or emerging adults (e.g., college subsidies), or employees (e.g., raising the minimum wage) or seniors (e.g., Social Security and Medicare)?

All of these age groups need help, but government programs are expensive. If we knew that a particular investment in one age group would have greater impact overall than the same money invested at another age, that would guide policy. But developmentalists disagree, even on who needs financial support most, much more on who most needs education, or family support. More science is needed. This leads us to the second phase of our definition.

SUMMING UP The scientific study of human development follows five steps: curiosity, hypothesis, data collection, conclusions, and reporting. Scientists build on prior studies, examining procedures and replicating results—thus confirming or refuting conclusions. This research method is designed to avoid wishful thinking, untested assumptions, and prejudice.

For instance, scientists no longer assume that development is either totally genetic or totally environmental. Instead, nature and nurture always interact, with variations between one person and another, as highlighted by differential susceptibility. Colic is one example.

The scientific method is followed within many disciplines and in all three domains—biosocial, cognitive, and psychosocial. Although each researcher typically concentrates on one aspect of development in one domain, no one stays in their own silo because science connects everyone's data and conclusions.

Once developmental scientists focused almost exclusively on children. Then adult development was recognized. Now researchers seek to understand which interventions at what ages are most effective for optimal development.

WHAT HAVE YOU LEARNED?

1. What makes the study of human development a science?
2. Why is replication sometimes considered an essential follow-up to the five steps of the scientific method?
3. Why is it a mistake to ask whether a human behavior stems from nature or nurture?
4. Why are some children more affected by their environment than others?
5. What is the difference between each of the three domains—biosocial, cognitive, and psychosocial?
6. Why do some people believe that the years of childhood are more crucial for development than the years of adulthood?

Including All Kinds of People

Developmentalists study everyone—young and old, rich and poor, of every ethnicity, background, sexual orientation, culture, and nation.

Difference or Deficit?

One reason to study people of all kinds is to combat the human inclination to think that anyone who is different is also deficient, i.e., lacking in something that is important for a good life. We are amused when young girls say, "Boys stink," or their male classmates say, "Girls are stupid," but adults have the same tendency: to judge people unlike themselves as inferior.



Family Pride Grandpa Charilaos is proud of his tavern in northern Greece (central Macedonia), but he is even more proud of his talented grandchildren, including Maria Soni (shown here). Note her expert fingering. Her father and mother also play instruments—is that nature or nurture?

For example, although males and females are similar in almost every trait, humans tend to look for sex differences, not similarities, and then to make sexist judgments. Most research finds far more similarities than differences between the sexes. One of the very few proven gender differences is that women are more tenderhearted and men more sexually driven (Hyde, 2014). If you are male, do you think that women are weak because they are too emotional; if you are female, do you think men are too obsessed with sex? If you answer yes, how human of you. And how wrong.

Negative judgments are too readily made about people who raise their children differently or who believe in an unfamiliar religion. Have you heard people criticize teenagers, middle-aged adults, or senior citizens? People tend to be critical of whatever age group is not their own.

The human tendency to observe differences and then conclude that people are inferior if they are unlike the observer is called the **difference-equals-deficit error.** Too quickly and without thought, differences are assumed to be problems (Akhtar & Jaswal, 2013).

difference-equals-deficit error The mistaken belief that a deviation from some norm is necessarily inferior to behavior or characteristics that meet the standard. Often the "norm" is the standard for the observer, and difference is anyone unlike oneself.

Sexual Orientation

The importance of accepting diversity is apparent when considering sexual orientation. Most teenagers are powerfully attracted to members of the other sex, but some—fewer than 1 teenager in 20—are attracted to people of their own sex (Brakefield et al., 2014). Same-sex attraction does not necessarily become sexual behavior, and even attraction is in dispute, as explained in Chapter 16. Here we use sexual orientation to illustrate a difference that was once assumed to be a deficit.

This perceived deficit led school bullies to target classmates thought to be lesbian, gay, bisexual, or transgender (LGBT) (Juvonen & Graham, 2014), and many LGBT teenagers themselves felt inferior. As a result, LGBT teenagers committed suicide at a much higher rate than did their heterosexual peers (Herek, 2010).

Over time, however, activism, scientific data, and other factors combined to cause a dramatic change in the culture. In the 1970s, psychiatrists and psychologists declared, "Homosexuality per se implies no impairment in judgment, stability, reliability" (Conger, 1975, p. 633), and by 2014, same-sex marriage—forbidden

Video: Research of Geoffrey Saxe
http://qrs.ly/9c4eoxh



COURTESY OF GEOFFREY SAXE

in every U.S. state before 2004—became legal in more than 30 U.S. states and in 17 other nations.

As this difference is less assumed to be a deficit, serious depression and crippling anxiety among LGBT youth has become less common. This is true generally, as well as within each family and community, although certainly there are some areas and families that reject such teens. Their rate of psychological problems is half as high in jurisdictions with policies that indicate acceptance (e.g., laws against hate crimes) compared to communities where same-sex attraction is still considered a deficit (Hatzenbuehler, 2014).

Culture, Ethnicity, and Race

To include "all kinds of people" requires that researchers study children of many cultures, ethnicities, and races. Yet each of these three terms is often confused, by scientists as well as non-scientists.

Culture, *ethnicity*, and *race* are **social constructions,** which means that they are created by society. Social constructions are powerful, affecting thoughts and behavior (as evident with people's ideas regarding sexual orientation), but since they arise from society, they can be changed by society. Because the study of development focuses on change over time, it is crucial that the fluidity and distinct meaning of each of these words be understood.

social construction An idea that is built on shared perceptions, not on objective reality. Many age-related terms (such as *childhood, adolescence, yuppie,* and *senior citizen*) are social constructions, strongly influenced by social assumptions.

A System of Shared Beliefs

For social scientists, **culture** is "the system of shared beliefs, conventions, norms, behaviors, expectations and symbolic representations that persist over time and prescribe social rules of conduct" (Bornstein et al., 2011, p. 30). Culture is far more than eating certain foods or practicing certain rituals; it is a powerful social construction.

culture A system of shared beliefs, norms, behaviors, and expectations that persist over time and prescribe social behavior and assumptions.

Each family, community, and college has a particular culture. For instance, Jamaicans in the United States are said to be tri-cultural (Jamaican, Black, American) (Ferguson et al., 2014). In any one person several cultures may clash.

Furthermore, individuals within each culture sometimes rebel against their culture's expected "beliefs, conventions, norms, behaviors." Cultural influences must be recognized, but not slavishly: Culture is powerful, but also fluid and changing.



POLARIS/NEWSCOM

Hard Floor, Hard Life These are among the thousands of unaccompanied children who fled Latin America and arrived in Arizona and Texas in 2014. Developmentalists predict that the effects of their hazardous journey will stay with them, unless sources of resilience—such as a caring family and supportive community—are quickly found. Culture and context make a difference for every childhood experience.

OBSERVATION QUIZ How many children are sleeping here in this photograph? (see answer, page 12)

LaunchPad

Watch **Video: Interview with Barbara Rogoff** to learn more about the role of culture in the development of Mayan children in Guatemala.

To appreciate that culture is a matter of beliefs and values, not superficial differences, consider language. Of course, people speak distinct languages, but that in itself is not a cultural difference. However, among some English-speaking groups in the United States, linguistic proficiency and independent thinking are encouraged. In families in those groups, children are encouraged to talk freely, and when they do, the adults listen approvingly. In other groups, a prime value is that each child learn respect for parents, and, by extension, for every adult: Children should never interrupt an adult conversation.

One of my East Indian students remembered:

> My mom was outside on the porch talking to my aunt. I decided to go outside. I guess I was being nosey. While they were talking I jumped into their conversation which was very rude. When I realized what I did it was too late. My mother slapped me in my face so hard that it took a couple of seconds to feel my face again.
>
> *C., personal communication]*

Notice that my student continues to reflect her culture; she labels her own behavior "nosey" and "very rude." She later wrote that she expects children to be seen but not heard and that her own son makes her "very angry" when he interrupts.

As in this case, cultural values, learned in childhood, tend to persist even when the overall culture has shifted. Culture is not a straightjacket, however. In fact, many parents (including many of Asian ancestry) allow their children more freedom of expression than their parents allowed them. And many parents who have been in North America all their lives nonetheless teach their children not to interrupt adults.

Heritage

ethnic group People whose ancestors were born in the same region and who often share a language, culture, and religion.

People of an **ethnic group** share certain attributes, almost always including ancestral heritage and usually national origin, religion, and language (Whitfield & McClearn, 2005). Ethnic group is not the same as cultural group: People of a particular ethnicity need not share a culture (compare people of Irish descent in Ireland and in Illinois), and some cultures include people of several ethnic groups (consider British culture).

Ethnicity is a social construction, affected by the social context. For everyone, ethnic identity is strengthened if (1) other members of the same group are nearby, and (2) other groups consider the person an outsider. Thus, ethnicity depends partly on context.

For example, people born in Africa who are longtime residents of North America typically consider themselves African, unless they are with many other African-born people. Then they might consider themselves by region (e.g. West African) or nation (Nigerian). However, African-born people living in their home country usually identify with a more specific ethnic group, such as the Ibo, Hausa, or Yoruba in Nigeria or the Kikuyo, Luhya, and Luo in Kenya.

Similar particular identities are evident everywhere: Ethnic identity becomes more specific and more salient (Sicilian, not just Italian; South Korean, not just East Asian) under certain circumstances. Many Americans are puzzled by distant civil wars (e.g., in Syria, or Sri Lanka, or the Ukraine) because people who look alike seem to be bitter enemies. However, those on opposing sides see many ethnic differences between them.

Physical appearance is sometimes a marker for ethnicity. The most visible example is skin color, often taken to indicate race. However, race is also a social construction—and a misleading one. There are reasons to abandon the term as well as reasons to keep it, as the following explains.

ANSWER TO OBSERVATION QUIZ (from page 11) Nine—not counting the standing boy or the possible tenth one whose head is under the blanket. Rumpled blankets suggest that eight more are elsewhere at the moment. Each night hundreds of children sleep in this Border Protection Processing Facility in Brownsville, Texas. They are detained while authorities decide whether to send them back to the countries they fled or to a safe place in the United States.

opposing perspectives*

Using the Word *Race*

The term **race** is used to categorize people via physical markers, particularly outward appearance. Historically, most North Americans believed that race was the outward manifestation of inborn biological differences. Fifty years ago, races were categorized by skin color: white, black, red, and yellow (Coon, 1962).

It is obvious now, but was not a few decades ago, that no one's skin is really white or black or red or yellow. Social scientists are convinced that race is a social construction, that society used color terms to exaggerate differences in skin tones.

Genetic analysis confirms that the biological concept of race is inaccurate. Although most genes are identical in every human, those few genetic differences that distinguish one person from another are poorly indexed by appearance (Race, Ethnicity, and Genetics Working Group of the American Society of Human Genetics, 2005).

Skin color is particularly misleading because dark-skinned people with African ancestors have "high levels of genetic population diversity" (Tishkoff et al., 2009, p. 1035) and dark-skinned people with non-African ancestors (such as indigenous Australians or Maori in New Zealand) share neither culture nor ethnicity with Africans.

Race is more than a flawed concept; it is a destructive one. It is used to justify racism: Slavery, lynching, and segregation were directly connected to the conviction that race was inborn. Racism continues today in less obvious ways (some highlighted later in this book), impeding the goal of our study—to help all kinds of people fulfill their potential.

Since race is a social construction that leads to racism and distracts us from recognizing other social problems, some social scientists believe that the term should be abandoned (Gilroy, 2000). It is no longer used in many nations.

A study of 141 nations found that 85 percent never use the word *race* on their census forms (Morning, 2008). Only in the United States does the census still distinguish between race and ethnicity, stating that Hispanics "may be of any race."

Because of the way human cognition works, such labels encourage stereotyping (Kelly et al., 2010). As one scholar explains:

> The United States' unique conceptual distinction between race and ethnicity may unwittingly support the longstanding belief that race reflects biological difference and ethnicity stems from cultural difference. In this scheme, ethnicity is socially produced but race is an immutable fact of nature. Consequently, walling off race from ethnicity on the census may reinforce essentialist interpretations of race and preclude understanding of the ways in which racial categories are also socially constructed.
>
> *(Morning, 2008, p. 255)*

Perhaps to avoid racism, the word *race* should not be used.

But consider the opposite perspective (Bliss, 2012). In a society with a history of racial discrimination, reversing that cultural heritage may require recognizing race. Although race is a social construction, not a biological distinction, it is powerful nonetheless. Particularly in adolescence, people who are proud of their racial identity are likely to achieve academically, resist drug addiction, and feel better about themselves (Crosnoe & Johnson, 2011; Zimmerman et al., 2013).

race A group of people who are regarded by themselves or by others as distinct from other groups on the basis of physical appearance, typically skin color. Social scientists think race is a misleading concept, as biological differences are not signified by outward appearance.



BY JHEI SHIN.DO/GETTY IMAGES

Young Laughter Friendship across ethnic lines is common at every age, when schools, workplaces, and neighborhoods are not segregated. However, past history has an impact: These two girls share so much that they spontaneously laugh together, unaware that this scene in a restaurant could not have happened 50 years ago. Many of the youngest cohorts have trouble understanding lynching, poll taxes, separate swimming pools, or even the historic March on Washington in 1963.

Many medical, educational, and economic conditions—from low birthweight to college graduation, from family income to health insurance—reflect racial disparities. To overcome such disparities, race may first need to be recognized.

Indeed, many social scientists argue that pretending that race does not exist allows racism to thrive (e.g., sociologists Marvasti & McKinney, 2011; anthropologist McCabe, 2011). Two political scientists studying criminal justice found that people who claim to be color-blind display "an extraordinary level of naiveté" (Peffley & Hurwitz, 2010, p. 113).

According to some scholars the election of President Obama revealed racial prejudice, and uninformed anti-racism unearths new forms of racism (Sullivan, 2014; Hughey & Parks, 2014). Perhaps race must be named and recognized before it can fade.

*Every page of this text includes information that requires critical thinking and evaluation. In addition, almost every chapter contains an Opposing Perspectives feature that highlights conflicting views of a developmental issue

Socioeconomic Status

Some social scientists believe that when studying "all kinds of people," differences in **socioeconomic status (SES)** are more potent than cultural or ethnic differences. SES affects every moment of development, from whether or not a zygote is conceived (rates of sexual activity and contraception vary by SES) to when a person dies (wealthy people live longer).

socioeconomic status (SES) A person's position in society as determined by income, occupation, education, and place of residence. (Sometimes called *social class*.)

Like culture, ethnicity, and race, SES is a complicated category. Income is part of socioeconomic status, but only part: For children, their neighborhood and their parents' level of education is often more influential. This is reflected when people speak of social class, as in "the shrinking middle class" or "working class values." Such phrases imply habits and attitudes as much as income (Stephens et al., 2012).

Consider a U.S. family comprised of an infant, an unemployed mother, and a father who earns $18,000 a year. Their SES would be low if the wage earner were an illiterate dishwasher living in an urban slum, but it would be high if the wage earner were a PhD student living on campus and teaching part-time.

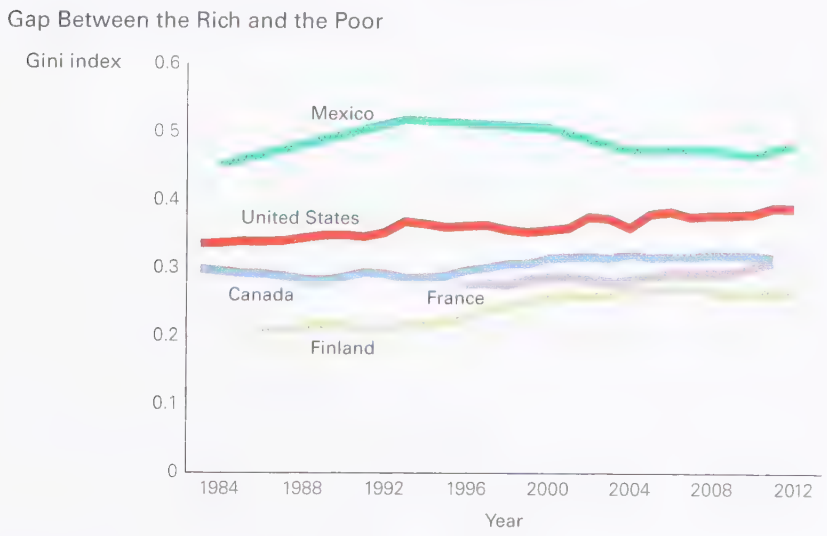
However, when governments categorize people they rely almost exclusively on income. The U.S. federal poverty line is based primarily on food cost and family size. That standard was set in 1965 and is still used, although economists find that shelter and medical costs are better indicators of income adequacy than food. According to 2014 federal cutoffs, a household of three people with a combined annual income under $19,790 (in Alaska, $24,730) is officially poor.

Policies and practices regarding poverty vary from nation to nation. In the United States, the gap between rich and poor, and between young and old, has increased in the past three decades (Lowrey, 2014) (see Figure 1.3). That has resulted in increased disparities in health, education, and neighborhood between those at the top and bottom.

For example, the life expectancy gap between the rich and poor has widened in the United States. Wealthy people live about six years longer than they did thirty years ago, but poor people die at almost the same age, on average, as their parents did.

FIGURE 1.3

The Rich Get Richer The Gini index is a measure of income equality, ranging from zero (everyone equal) to one (one person has all the money). Values here are after taxes, which shows that the gap between rich and poor is widening in the United States and Finland but not in other countries. Worldwide, the gap between the richest people and the poorest is even wider, estimated at about 0.63 on the Gini.



Source: Lowrey, 2014.

SES affects almost every aspect of life in every nation and in every region of each nation, as illustrated in Visualizing Development (see the inside cover). That fact is known to everyone who examines the data, although not everyone agrees about the specifics or the implications (Chambers et al., 2014).

Finding the Balance

All humans are the same. Yet as sex, culture, ethnicity, and SES make clear, every group is different. Furthermore, genetically each individual is unique. Is that a paradox, a dilemma, or a challenge? How general, and how specific, should developmentalists be? A leading scholar wrote:

> Psychologists and psychiatrists are fond of writing sentences such as "individuals with the short allele of the serotonin transporter [the 5-HTTLPR gene mentioned

> earlier] are vulnerable to depression if they experience past stressors." . . . I suggest that they should more often write sentences such as "women with a European pedigree possessing the short allele of the serotonin transporter who live in a large city far from their family, and grew up as a later born child in an economically disadvantaged family are at risk for depression."
>
> *[Kagan, 2011, p. 111]*

Kagan's suggestion is meant to be an exaggeration: The right balance between generalizations and specifics is not obvious, but Kagan insists that developmental conclusions should never be "contextually naked" (2011, p. 112). In other words, variations in background and circumstances should always be considered. Not only are neither nature nor nurture determinative, but also making simple predictions, across or within groups, is a mistake.

Both dismissing the impact of SES, culture, and so on, and taking it too much to heart, are mistakes. One of my students did the former, saying, "That's just a statistic, it doesn't apply to me," and another did the latter, saying "Now that I know all the risks for a woman like me, I will never have children." I tried to dissuade them both.

Remember that differences are not necessarily deficits, racial and ethnic categories are social constructions, and income does not trump education. Yet all differences, categories, and incomes have an effect on everyone, an effect that is neither intractable nor irrelevant. Effects change over time. This leads to the third aspect of our definition.



AP PHOTO/MATT [illegible] NE BOB PENNELL

Fresh Fruit Many religious groups provide food for low-income families. Lisa Arsa is fortunate to have found this Seventh Day Adventist food pantry for herself and her son, Isaac. Unfortunately, the food donated to low-income families is usually high in salt, sugar, and fat—among the reasons why the U.S. rates of obesity and diabetes rise as income falls.

SUMMING UP Persons of every age, culture, and background teach us what is universal and what is unique in human development. Differences among people are not necessarily deficits, although some people mistakenly assume that their own path and choices are best for everyone.

Each person grows up with an ethnic identity and within several cultures. As social constructions, culture and ethnicity can change, but they have an impact. Race is no longer considered a biological category, but it is nonetheless a potent factor in development. Finally, socioeconomic status, which includes parents' income and education, powerfully affects the development of a child: SES affects medical care, schooling, and neighborhood, each shaping every child's body and brain. Taking all the contextual influences on child development into account, while recognizing that each child is unique, not determined by their SES or any social construction, is a challenge for developmentalists.

WHAT HAVE YOU LEARNED?

1. How are opinions on sexual orientation an example of the difference-equals-deficit error?
2. How can cultural values been seen as a social construction?
3. What is the relationship between ethnic group and culture?
4. Why is it more useful to consider ethnicity and culture instead of the differences in appearance that are used to indicate race?
5. What factors are used to indicate a person's SES?

As Time Goes On

The effects of time are the heartbeat of human development, the essence of what we study. As already explained, an earlier idea—that development advances gradually until about age 18, steadies, and then declines—has been refuted by life-span research. We now know, though, that aspects of change appear and disappear, with increases, decreases, and zigzags (see Figure 1.4).

The pace of change differs as well. Sometimes *discontinuity* is evident: Change can occur rapidly and dramatically, as when caterpillars become butterflies. Sometimes *continuity* is found: Growth can be gradual, as when redwoods add rings over hundreds of years. And sometimes no change seems to occur: Stability itself is remarkable.

Humans experience simple growth, radical transformation, improvement, and decline as well as stability, change, and continuity—day to day, year to year, and generation to generation.

No matter what the pattern, age is always significant, and that is the focus of our study. Is it normal for a boy to throw himself down, kicking and screaming, when he is frustrated? Yes, if he is 2 years old; no, if he is 12. Is it normal for a girl to be interested in boys? Yes, at age 16; no, at age 6. More broadly, children think, play, and learn differently depending partly on their age.

Critical Periods

Some changes are sudden and profound because of a **critical period,** a time when something *must* occur for normal development or the only time when an abnormality can occur. For instance, the critical period for humans to grow arms and legs, hands and feet, fingers and toes, is between 28 and 54 days after conception. After that, it is too late: Unlike some insects, humans never grow replacement limbs or digits.

critical period A time when a particular type of developmental growth (in body or behavior) must happen for normal development to occur.

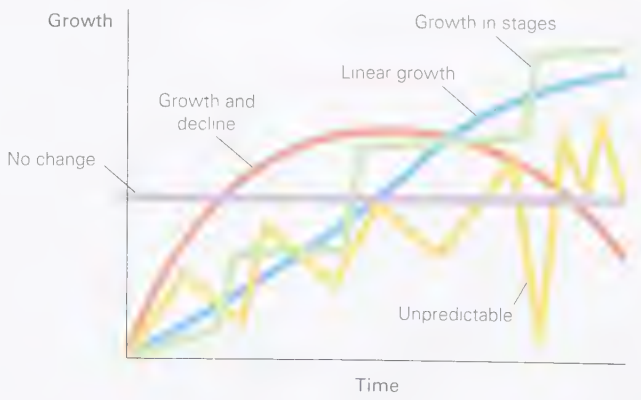


FIGURE 1.4

Patterns of Developmental Growth Many patterns of developmental growth have been discovered by careful research. Although linear progress seems most common, scientists now find that almost no aspect of human change follows the linear pattern exactly.

Thalidomide

Sensitive Periods

Often, however,

sensitive period.



Your Child's Teacher This 19-year-old

is studying to be a teacher. Emerging adulthood worldwide is a period

professions and locations in the next

sensitive period A time when a certain

Often, in development, individual exceptions to general patterns occur. Sweep-

Ecological Systems

Bronfenbrenner recommended that developmentalists take an **ecological-systems approach** (Bronfenbrenner & Morris, 2006) to understand humans.

ecological-systems approach A

considers all the influences from the various contexts of development. (Later renamed *bioecological theory*.)

Systems Within Systems Within Systems

The ecological-systems approach recognizes three nested levels of factors that



FIGURE 1.5

The Ecological Model According to developmental researcher Urie Bronfenbrenner, each person is significantly affected by interactions among a number of overlapping systems, which provide the context of development. *Microsystems*—family, peer groups, classroom, neighborhood, house of worship—intimately and immediately shape human development. Surrounding and supporting the microsystems are the *exosystems*, which include all the external networks, such as community structures and local educational, medical, employment, and communications systems, that influence the microsystems. Influencing both of these systems is the *macrosystem*, which includes cultural patterns, political philosophies, economic policies, and social conditions. *Mesosystems* refer to interactions among systems, as when parents and teachers coordinate to educate a child. Bronfenbrenner eventually added a fifth system, the *chronosystem*, to emphasize the importance of historical time.

The impact of each microsystem depends partly on timing. For instance, peers are far more important in adolescence than in infancy.

Also important are *exosystems* (local institutions such as school and church) and *macrosystems* (the larger social setting, including cultural values, economic policies, and political processes).

Two more systems are related to these three. One is the *mesosystem*, consisting of the connections among the other systems. The other is the *chronosystem* (liter-



ZUMA PRESS, INC. / ALAMY

Breathe, Don't Sink Ben Schwenker is learning "drown-proofing," important for a skinny 8-year-old, since his low body fat (a physiological system) makes floating harder. Ecological systems also make this skill vital, since Ben is in Marietta, a city with thousands of pools, in Georgia, a state bordered by the Atlantic. Another system is relevant: Ben was diagnosed with autism at age 1; for him, a sense of body strength and autonomy is particularly important.

ally, "time system"); it is the historical context that allows developmentalists to focus specifically on the influence of changing historical circumstances.

Bronfenbrenner believed that people need to be studied in their natural contexts repeatedly over time (Bronfenbrenner, 1977; 1986). He looked at children playing, or mothers putting babies to sleep, or nurses in hospitals—never asking people to come to a scientist's laboratory for a contrived experiment.

Toward the end of his life, Bronfrenbrenner renamed his approach *bioecological theory* to highlight the role of biology, recognizing that systems within the body (e.g., the sexual-reproductive system, the cardiovascular system) affect the external systems as time goes on (Bronfenbrenner & Morris, 2006).

Historical Change

In studying development, it matters, of course, how old a child is, but it also matters what the political and medical conditions are when a child reaches a particular age. Both generational and cohort effects need to be considered. This needs some explanation.

All persons born within a few years of one another are called a **cohort.** Cohorts travel through life together, affected by the interaction between their chronological age and the values, events, technologies, and culture of the era. From the moment of birth, when parents decide the name of their baby, historical context is crucial (see Table 1.1).

Consider attitudes and data about marijuana. In the United States in the 1930s, marijuana was declared illegal, but enforcement was erratic. Then in the 1980s, marijuana was labeled a "gateway drug," likely to lead to drug abuse and addiction (Kandel, 2002). People were arrested and jailed for possession of even a few ounces of the drug.

From 1990 on, attitudes gradually changed. By 2014, general marijuana use became legal in two states, and medical use was permitted in several others. According to a Gallup poll, more than half (54 percent) of Americans approve making marijuana use legal, as long as it is used by adults and not in public (Motel, 2014).

These historical shifts have had a notable effect on high school students (Johnston et al., 2014 and previous years). In 1978, only 12 percent thought experimental use of marijuana was harmful, and more than half had tried the drug. In 1991, when the gateway drug message became widespread, 80 percent thought there was "great risk" in regular use and only 21 percent ever smoked the drug. Since then, marijuana use has increased as attitudes have become more accepting: Approximately one-third of high school seniors used it in 2013.

Thus cohort, more than generation, influences attitudes and behavior toward marijuana. The same is true for adults' attitudes and behavior: It matters more



"Hey! Elbows off the table."

Twenty-First-Century Manners
If he obeyed his father but kept texting, would Emily Post be pleased?

cohort People born within the same historical period who therefore move through life together, experiencing the same events, new technologies, and cultural shifts at the same ages. For example, the effect of the Internet varies depending on what cohort a person belongs to.

TABLE 1.1 Popular First Names Since 1933

Girls:	Boys:
2013: Sophia, Emma, Olivia, Isabella, Ava	2013: Noah, Liam, Jacob, Mason, William
1993: Jessica, Ashley, Sarah, Samantha, Emily	1993: Michael, Christopher, Matthew, Joshua, Tyler
1973: Jennifer, Amy, Michelle, Kimberly, Lisa	1973: Michael, Christopher, Jason, James, David
1953: Mary, Linda, Deborah, Patricia, Susan	1953: Robert, James, Michael, John, David
1933: Mary, Betty, Barbara, Dorothy, Joan	1933: Robert, James, John, William, Richard

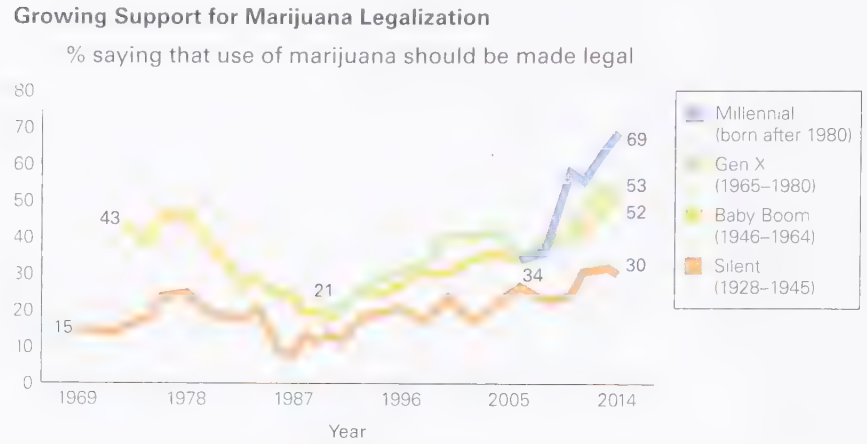
Source: U.S. Social Security Administration

when an adult was born than how old that adult is. It is wiser, for example, to seek generalities about people born in 1950 rather than about people who are in their 60s, or 70s, or whatever (see Figure 1.6).

FIGURE 1.6

Not Generation Sometimes people praise (or criticize) young adults for their attitudes or behavior, but perhaps people should credit (or blame) history instead. Note that even when they were young, the oldest generations did not think that marijuana should be legal, nor were they likely to endorse same-sex marriage or even mothers of young children working outside the home On many issues, personal experience matters more than age.

OBSERVATION QUIZ Why is the line for Millennials much shorter than the line for the Silent Generation? (see answer, p. 25)



Source: From the Pew Research Center article, America's New Drug Policy Landscape Two-Thirds Favor Treatment, Not Jail, for Use of Heroin, Cocaine, April 2, 2014. http: www peoplepress.org 2014 04 02 americas new-drug policy-landscape

Plasticity

plasticity The idea that abilities, personality, and other human characteristics can change over time. Plasticity is particularly evident during childhood, but even older adults are not always "set in their ways."

dynamic-systems approach A view of human development as an ongoing, ever-changing interaction between the physical, cognitive, and psychosocial influences. The crucial understanding is that development is never static but is always affected by, and affects, many systems of development

The term **plasticity** denotes two complementary aspects of development: Human traits can be molded (as plastic can be), and yet people maintain a certain durability (as plastic does). This provides both hope and realism—hope because change is possible and realism because development builds on what has come before.

Plasticity is basic to our contemporary understanding of human development because it simultaneously incorporates two facts: People can change over time, and new behavior depends partly on what has already happened.

This is evident in one of the newer approaches to development, the **dynamic-systems approach.** The idea behind this approach is that human development is an ongoing, ever-changing interaction between the individual and all the systems described above. This approach began with nature:

> [S]easons change in ordered measure, clouds assemble and disperse, trees grow to a certain shape and size, snowflakes form and melt, minute plants and animals pass through elaborate life cycles that are invisible to us, and social groups come together and disband.
>
> *[Thelen & Smith, 2006, p. 271]*

Especially for Future Teachers Does the classroom furniture shown in the photograph to the right affect instruction? (see response, page 22)



AP PHOTO/JIM MONE

Dynamic Interaction A dynamic-systems approach highlights the ever-changing impact that each part of a system has on all the other parts. This classroom scene reflects the eagerness for education felt by many immigrants, the reticence of some boys in an academic context, and a global perspective (as demonstrated by the world map). These 'a ets emerge from various systems—family, gender, and culture—and they have nteracted to produce this moment

OBSERVATION QUIZ What country is this? e answer, page 22)

Note the word *dynamic*: Physical contexts, emotional influences, the passage of time, each person, and every aspect of the ecosystem are always interacting, always in flux, always in motion. For instance, a new approach to developing the motor skills of children with autism spectrum disorder stresses the dynamic systems that undergird movement—the changing aspects of the physical and social contexts (Lee & Porretta, 2013). Using those systems may help the autistic child—not to make the autism disappear (plasticity implies that past conditions are always influential) but to make the child function more smoothly.

Plasticity is especially useful in understanding the potential of a particular person: Everyone is constrained by past circumstances but not confined by them. David is an example.

a case to study

Plasticity and David

My sister-in-law had rubella (called German measles) early in her third pregnancy, a fact not recognized until David was born, blind and dying. Heart surgery two days after birth saved his life, but surgery at 6 months to remove a cataract destroyed that eye. Malformations of his thumbs, ankles, teeth, feet, spine, and brain became evident. He was skinny; he cried a lot. Predictions were dire. Some people wondered why his parents did not place him in an institution. He did not walk or talk for years.

He was born in 1967, just when parents and educators successfully advocated that "every child can learn." Plasticity meant there was hope for David, and my brother and his wife sought out specialists who believed David could defy early predictions.

For example, most 9-month-olds can crawl but David did not, because his parents kept him safe in their arms or in his crib. Then a consultant from the Kentucky School for the Blind put him on a large rug, teaching him to feel the boundaries and crawl safely.

At age 1 David did not talk, but an audiologist found that he could hear, and teachers encouraged my brother and his wife to sing and read to him. At age 2½ he did not chew, but a nutritionist showed his parents how to force him to eat food that was not pureed. In middle childhood, doctors repaired his heart, removed the remaining cataract, realigned his jaw, replaced the dead eye with a glass one, and straightened his spine with a brace.

Dozens of educators taught him. David attended three specialized preschools, then a mainstreamed public school, then a special high school, then the University of Louisville.

Remember, plasticity cannot erase genes, childhood experiences, or permanent damage. David's disabilities are always with him. But the interaction of nature and nurture meant that, by age 10, David had skipped a year of school and was a fifth-grader, reading at the eleventh-grade level with thick glasses. He learned German and Russian, with some Spanish and Korean, and how to circumvent his handicaps. For example, he walks and swims for exercise, since he could not play basketball (as his brothers did).


GLEN STASSEN

My Brother's Children Michael, Bill, and David (left to right) are adults now, with quite different personalities, abilities, and offspring (4, 2, and none), and contexts (in Massachusetts, Pennsylvania, and California). Yet despite genes, prenatal life, and contexts, I see the shared influence of Glen and Dot, my brother and sister-in-law—evident here in their similar, friendly smiles.

David now works as a translator of German texts. He enjoys that because, as he told me, "I like providing a service to scholars, giving them access to something they would otherwise not have." He uses a computer to read and write.

Family members continue to be crucial to his well-being. They still remind him to wash his hair, guide him in social situations, and accompany him to medical appointments. David now has two sisters-in-law who telephone him weekly, discussing politics, religion, sports, and so on. The baby whose birth was a reason for despair has become an adult who contributes to his family and his community. Plasticity is possible; David proves that.

[illegible] from page 20 The three [illegible] wearing measatives [illegible] out these [illegible] [illegible] Mmeasoles Mmesou [illegible] the United States Clues include the [illegible] this school has students from [illegible] clothing [illegible] Western [illegible] and—to the sharp-eyed—the flag near the door

Response for Future Teachers [illegible] from page 20 Yes Every aspect of the ecological context affects what happens in this classroom tables and movable chairs foster group cooperation and conversation—potent learning methods that are difficult to achieve when desks and seats are bolted to the floor and the teacher is seen not as large desk

[illegible]

[illegible] with large [illegible] start [illegible] of the [illegible] of the [illegible] ecological [illegible] ecological [illegible] ecological

Every research design, method, and statistical measure has strengths as well as weaknesses. It is impossible to describe them all here; there are so many that colleges offer year-long courses in research design and other courses in statistics. Here we describe three basic research strategies—observation, the experiment, and the survey—and then three ways developmentalists study change over time.

Observation

Scientific observation requires researchers to record behavior systematically and objectively. Observations often occur in a naturalistic setting such as a home, where people behave normally. Scientific observation can also occur in a laboratory where scientists record human reactions in various situations, often with wall-mounted video cameras and the scientist in another room.

Observation is crucial to the development of hypotheses. However, observation provides issues to explore, not proof.

For example, one study of how long parents lingered when dropping off their children in preschool found that children were slower to engage with toys or friends when their parents stayed longer (Grady et al., 2012). This could mean that parental hesitancy to leave made children less social with friends. However, the opposite interpretation is also possible. Perhaps shy children cause parents to linger. Thus this study led to two alternative hypotheses: More research is needed to ascertain which one is more accurate.

The Experiment

The **experiment** establishes what causes what. In the social sciences, experimenters typically impose a particular treatment on a group of volunteer participants or expose them to a specific condition and then note whether their behavior changes.

LaunchPad



SERGIY BYKHUNENKO/ SHUTTERSTOCK

Video Activity: What's Wrong with This Study explores some of the major pitfalls of the process of designing a research study.

scientific observation A method of testing a hypothesis by unobtrusively watching and recording participants' behavior in a systematic and objective manner—in a natural setting, in a laboratory, or in searches of archival data.

experiment A method to determine cause and effect. Researchers control the participants and the interventions, which makes it easier to understand what causes what, for whom.

The Experiment

Many participants, measured on many characteristics, including the dependent variable (the behavior being studied)	Experimental group	Special treatment (independent variable)	Significant change in the dependent variable
	(two equal groups)		(predicted outcome)
	Comparison (or control) group	No special treatment	No change in the dependent variable

Procedure:

1. Divide participants into two groups that are matched on important characteristics, especially the behavior that is the dependent variable on which this study is focused.
2. Give special treatment, or intervention (the independent variable), to one group (the experimental group).
3. Compare the groups on the dependent variable. If they now differ, the cause of the difference was probably the independent variable.
4. Publish the results.

FIGURE 1.7

How to Conduct an Experiment The basic sequence diagrammed here applies to all experiments. Many additional features, especially the statistical measures listed in Table 1.2 and various ways of reducing experimenter bias, affect whether publication occurs. (Scientific journals reject reports of experiments that were not rigorous in method and analysis.)

independent variable In an experiment, the variable that is introduced to see what effect it has on the dependent variable. (Also called *experimental variable*.)

dependent variable In an experiment, the variable that may change as a result of whatever new condition or situation the experimenter adds. In other words, the dependent variable *depends* on the independent variable.

survey A research method in which information is collected from a large number of people by interviews, written questionnaires, or some other means.

case study An in-depth study of one person, usually requiring personal interviews to collect background information and various follow-up discussions, tests, questionnaires, and so on.

Especially for Nurses In the field of medicine, why are experiments conducted to test new drugs and treatments? (see response, page 26)

In technical terms, the experimenters manipulate an **independent variable,** which is the imposed treatment or special condition (also called the *experimental variable*; a *variable* is anything that can vary). They note whether this independent variable affects whatever they are studying, called the **dependent variable** (which *depends* on the independent variable).

Thus, the independent variable is the new, special treatment; any change in the dependent variable is the result. The purpose of an experiment is to find out whether an independent variable affects the dependent variable. In a typical experiment (as diagrammed in Figure 1.7), two groups of participants are studied. One group, the *experimental group,* is subjected to the particular treatment or condition (the independent variable); the other group, the *comparison group* (also called the *control group*), is not.

The Survey

A third research method is the **survey,** in which information is collected from a large number of people by interview, questionnaire, or some other means. This is a quick, direct way to obtain data.

Unfortunately, although surveys may be quick and direct, they are not necessarily accurate. When pollsters try to predict elections, they survey thousands of potential voters. They hope that the people they survey will vote as they say they will, that undecided people will follow the trends, and that people who refuse to give their opinion, or who are not included, will be similar to those surveyed. None of this is certain. Some people lie, some change their minds, some (especially those who don't have phones or who never talk to strangers) are never counted.

Furthermore, survey answers are influenced by the wording and the sequence of the questions. For instance, according to many scientists, "climate change" and "global warming" are two ways to describe the same phenomenon, yet many people believe in climate change but not in global warming (McCright & Dunlap, 2011). For that reason, surveys that seem to be about the same issue may reach opposite conclusions.

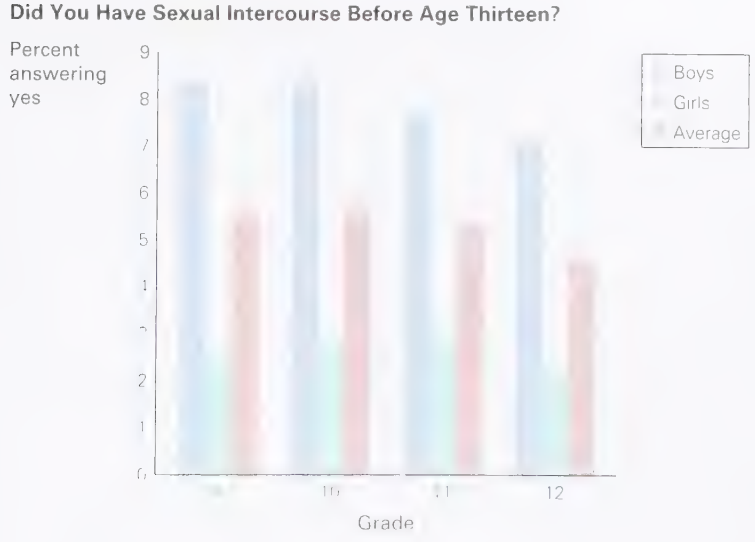
Additionally, survey respondents present themselves as they would like to be perceived. For instance, every two years since 1991, high school students in the United States have been surveyed. The participants are carefully chosen to be representative of all students in the nation. The most recent survey included 13,633 students from all 50 states and from schools large and small, public and private (MMWR, June 13, 2014).

Students are asked whether they had sexual intercourse *before* age 13. Every year, compared to the twelfth-grade boys, far more ninth-grade boys say they had sex before age 13 (see Figure 1.8). Do seniors forget or do ninth-graders lie? Or are some 13-year-olds proud of early sexual experience but ashamed by age 17? Or have all the sexually experienced boys left school by twelfth grade? These are all possibilities; surveys cannot tell us.

To understand responses in more depth, another method can be used—the **case study,** which is an in-depth study of one person. Case studies usually require personal interviews, background information, test or questionnaire results, and more.

FIGURE 1.8

I Forgot? If this were the only data available, you might conclude that ninth-graders have suddenly become more sexually active than twelfth-graders. But we have 20 years of data—ninth-graders always answer differently by twelfth grade.



Source: MMWR, June 13, 2014

Although case studies seem more accurate than more superficial measures, the assumptions and interpretations of the researcher may bias the results.

Even if accurate, the case study applies only to one person, who may be quite unlike other people. For instance, my report on my nephew David is a case study, but David is unique: Other embryos exposed to rubella may have quite different lives than David's.

ANSWER TO OBSERVATION QUIZ
(from page 20) Because surveys rarely ask children their opinions, and the Millennials did not reach adulthood until about 2005.

Studying Development over the Life Span

In addition to conducting observations, experiments, and surveys, developmentalists must be mindful of the last part of our definition of the science of human development—they measure how people *change (or remain the same) over time.* To do this they use one of three basic research designs: cross-sectional, longitudinal, or cross-sequential (see Figure 1.9).

FIGURE 1.9
Which Approach Is Best? Cross-sequential research is the most time-consuming and complex, but it yields the best information. One reason that hundreds of scientists conduct research on the same topics, replicating one another's work, is to gain some advantages of cross-sequential research without waiting for decades.

CROSS-SECTIONAL
Total time: A few days, plus analysis

birth	age 3	age 6	age 9	age 12
Time 1	Time 1	Time 1	Time 1	Time 1

Collect data once. Compare groups. Any differences, presumably, are the result of age.

LONGITUDINAL
Total time: 12 years, plus analysis

birth	age 3	age 6	age 9	age 12
	[3 years later]	[3 years later]	[3 years later]	[3 years later]
Time 1	Time 1 + 3 years	Time 1 + 6 years	Time 1 + 9 years	Time 1 + 12 years

Collect data five times, at 3-year intervals. Any differences for these individuals are definitely the result of passage of time (but might be due to events or historical changes as well as age).

CROSS-SEQUENTIAL
Total time: 12 years, plus double and triple analysis

birth	age 3	age 6	age 9	age 12
	[3 years later]	[3 years later]	[3 years later]	[3 years later]
	birth	age 3	age 6	age 9
For cohort effects, compare groups on the diagonals (same age, different years).		[3 years later]	[3 years later]	[3 years later]
		birth	age 3	age 6
			[3 years later]	[3 years later]
Time 1	Time 1 + 3 years	Time 1 + 6 years	Time 1 + 9 years	Time 1 + 12 years

Collect data five times, following the original group but also adding a new group each time. Analyze data three ways, first comparing groups of the same ages studied at different times. Any differences over time between groups who are the same age are probably cohort effects. Then compare the same group as they grow older. Any differences are the result of time (not only age). In the third analysis, compare differences between the same people as they grow older, *after* the cohort effects (from the first analysis) are taken into account. Any remaining differences are almost certainly the result of age.



Six Stages of Life These photos show Sarah-Maria, born in 1980 in Switzerland, at six stages of her life: infancy (age 1), early childhood (age 3), middle childhood (age 8), adolescence (age 15), emerging adulthood (age 19), and adulthood (age 30).

OBSERVATION QUIZ Longitudinal research best illustrates continuity and discontinuity For Sarah-Maria, what changed over 30 years and what didn't? (see answer, page 28)

Cross-Sectional Research

The quickest and least expensive way to study development over time is with **cross-sectional research,** in which groups of people of one age are compared with groups of people of another age. Such research has found, for instance, that in the United States in 2012, 74 percent of men aged 25 to 29 were in the labor force, but only 52 percent of those aged 60 to 64 were (U.S. Bureau of Labor Statistics, 2011). It seems that about one-third of all men stop working between age 30 and age 60. Younger adults might imagine them golfing in the sun, happy with their pensions and free time.

cross-sectional research A research design that compares groups of people who differ in age but are similar in other important characteristics.

Cross-sectional design seems simple. However, it is difficult to ensure that the various groups being compared are similar in every way except age. In this example, the younger U.S. men, on average, had more education than the older ones. Thus, what seems to be the result of age might actually have to do with schooling: Perhaps education, not age, accounted for the higher employment rates of the younger adults. Or perhaps age discrimination was the problem: The older adults may have wanted jobs but been unable to get them.

Longitudinal Research

To help discover whether age itself rather than cohort causes a developmental change, scientists undertake **longitudinal research.** This research requires collecting data repeatedly on the same individuals as they age. Longitudinal research is particularly useful in tracing development over many years.

longitudinal research A research design in which the same individuals are followed over time, as their development is repeatedly assessed.

Longitudinal research has several drawbacks, however. Over time, participants may withdraw, move to an unknown address, or die. Another problem is that participants become increasingly aware of the goals of the study—knowledge that makes them less typical, and thus the results become less valid.

Finally, the historical context changes, which limits the current relevance of data on people born decades ago. Results from longitudinal studies of people born in 1910 may not be applicable to people born in 2010.

✓ Response for Nurses (from page 24) Experiments are the only way to determine cause-and-effect relationships. If we want to be sure that a new drug or treatment is safe and effective, an experiment must be conducted to establish that the drug or treatment improves health

Longitudinal research requires years of data. For example, alarm about possible future harm caused by ingesting *phthalates* and *bisphenol A* (BPA) (chemicals used in manufacturing) from plastic baby bottles and infant toys leads many parents to use glass baby bottles. But perhaps the risk of occasional shattered glass causes more harm than the chemicals in plastic, or perhaps the mother's use of cosmetics, which puts phthalates in breast milk, is a much greater source of the chemicals than any bottles (Wittassek et al., 2011).

Could breast-feeding harm infants? Virtually every scientist and pediatrician is convinced that the benefits of breast milk outweigh any dangers. However, we need accurate predictions about the future for infants who are breast- or bottle-fed now.

Another issue is whether e-cigarettes will entice more teenagers to become addicted to nicotine. Those who profit from vaping say no; public health doctors fear yes. Only longitudinal research can answer for certain, but then it might be too late (Hajek et al., 2014; Bhatnagar et al., 2014; Dutra & Glantz, 2014).

Especially for Future Researchers What is the best method for collecting data? (see response, page 29)

Cross-Sequential Research

Scientists have found a third strategy, called **cross-sequential research,** which combines cross-sectional and longitudinal research. (It is also referred to as *cohort-sequential* or *time-sequential research.*) With this design, researchers study several groups of people of different ages (a cross-sectional approach) and follow them over the years (a longitudinal approach).

cross-sequential research A research design in which researchers first study several groups of people of different ages (a cross-sectional approach) and then follow those groups over the years (a longitudinal approach). (Also called *cohort-sequential research* or *time-sequential research.*)

With cross-sequential design, researchers compare a group of, say, 6-year-olds, with data on the same individuals at birth and age 3 (a longitudinal approach); they also compare this data with data from another group at birth and at age 3 and with data on a group of newborns (a cross-sectional approach) (see Figure 1.9).

If those 6-year-olds were similar at birth to the new babies and the 3-year-olds, then the newborns will probably develop as the 6-year-old did. But if historical changes have made the new babies healthier, or heavier, or different in any other notable way, then some data on the 6-year-olds may not apply.

Here is one example. Cross-sequential research discovered that when a father is absent or unemployed, his children suffer more in middle childhood than infancy (Sanson et al., 2011). That conclusion could not have been reached by cross-sectional or longitudinal research alone.



MARK BOWDEN/GETTY IMAGES



Compare These With Those These children seem ideal for cross-sectional research—they are school children of both sexes and many ethnicities. Their only difference seems to be age, so a study might conclude that 6-year-olds raise their hands but 16-year-olds do not. But any two groups in cross-sectional research may differ in ways that are not obvious—perhaps income, national origin, or culture—and that may be the underlying reason for any observed age differences

ANSWER TO OBSERVATION QUIZ (from page 26) Of course, much changed and much did not change, but evident in the photos is continuity in Sarah-Maria's happy smile and the discontinuity in her hairstyle (which shows dramatic age and cohort changes)

SUMMING UP Scientists use many methods and research designs to investigate development. Ideally, conclusions from one type of study are confirmed by other types. For example, careful and systematic observation can discover phenomena that were previously unnoticed, and then experiments can uncover causes. Surveys are quick but vulnerable to bias in the questions asked, the answers given, and the interpretation of those answers. Case studies are detailed, but it is folly to draw general conclusions from the details of any one individual.

To study change over time, cross-sectional, longitudinal, and cross-sequential designs are used, each with advantages and disadvantages. Cross-sectional is quickest, longitudinal may be more accurate, and cross-sequential combines the two, reaching conclusions that neither cross-sectional nor longitudinal research could find in isolation.

WHAT HAVE YOU LEARNED?

1. How do scientific observation and experimentation differ?
2. Why do experimenters use a control (or comparison) group as well as an experimental group?
3. What are the strengths and weaknesses of the survey method?
4. What are the advantages and disadvantages of cross-sectional research?
5. What are the advantages and disadvantages of longitudinal research?
6. What are the advantages and disadvantages of cross-sequential research?

Cautions and Challenges from Science

The scientific method illuminates and illustrates human development as nothing else does. Facts, hypotheses, and possibilities have all emerged that would not be known without science—and people of all ages are healthier, happier, and more capable than people of previous generations because of it.

For example, infectious diseases in children, illiteracy in adults, depression in late adulthood, and racism and sexism at every age are much less prevalent today than a century ago. Science deserves credit for all these advances. Even violent death is less likely, with scientific discoveries and universal education considered likely reasons (Pinker, 2011).

Developmental scientists have also discovered unexpected sources of harm. Video games, cigarettes, television, shift work, and asbestos are all less benign than people first thought. Although the benefits of science are many, so are the pitfalls. We now discuss three potential hazards: misinterpreting correlation, depending too heavily on numbers, and ignoring ethics.

Correlation and Causation

Probably the most common mistake in interpreting research is confusing correlation with causation. A **correlation** exists between two variables if one variable is more –or less—likely to occur when the other does. A correlation is *positive* if both variables tend to increase together or decrease together, *negative* if one variable tends to increase while the other decreases, and *zero* if no connection is evident.

correlation A number between +1.0 and –1.0 that indicates the degree of relationship between two variables, expressed in terms of the likelihood that one variable will (or will not) occur when the other variable does (or does not). A correlation indicates only that two variables are somehow related, not that one variable causes the other to occur

To illustrate: From birth to age 9, there is a positive correlation between age and height (children grow taller as they grow older), a negative correlation between age and napping (children nap less often as they grow older), and zero correlation between age and number of toes (children do not grow new toes with age). (Now try the quiz on correlation in Table 1.3.)

Quiz on Correlation

Two Variables	Positive, Negative, or Zero Correlation?	Why? (Third Variable)
1. Ice cream sales and murder rate	_____	_____
2. Reading ability and number of baby teeth	_____	_____
3. Sex of adult and his or her average number of offspring	_____	_____

For each of these three pairs of variables, indicate whether the correlation between them is positive, negative, or nonexistent. Then try to think of a third variable that might determine the direction of the correlation. The correct answers are printed upside down at right.

Many correlations are unexpected. For instance, first-born children are more likely to develop asthma than are later-born children, teenage girls have higher rates of mental health problems than do teenage boys, and newborns of immigrants weigh more than do newborns of nonimmigrants. All these surprising correlations are discussed later.

However, *correlation is not causation*. Just because two variables are correlated does not mean that one causes the other—even if it seems logical that it does. Correlation proves only that the variables may be connected. Indeed, sometimes two variables follow the same pattern but are not connected at all (see Visualizing Development on p. 31).

Many mistaken and even dangerous conclusions are drawn because people misunderstand correlation, as the following A View from Science explains.

Answers:
1. Positive; third variable: heat
2. Negative; third variable: age
3. Zero; each child must have a parent of each sex; no third variable

// Response for Future Researchers
(from page 27) There is no best method for collecting data. The method used depends on many factors, such as the age of participants (infants can't complete questionnaires), the question being researched, and the time frame.

a view from science

Vaccination and Autism

The most recent confusion of correlation and causation regards autism spectrum disorders. Generally, the first signs of autism occur early in life, when a parent notices something wrong with how their baby responds to people. For instance, the infant might not smile, laugh, or even listen to voices or look at faces the way most babies do. Then talking is delayed, abnormal, or even absent, and the baby cries at sensations that don't bother most infants.

Thirty years ago some psychologists blamed mothers' child care for autism (the "refrigerator mom") but now most experts believe something genetic or prenatal disrupted normal social connections in the brain. That implies either that the parents carry the genes for autism or that the mother harmed the fetal brain when she was pregnant, or both (Persico & Merelli, 2014). Understandably, some parents seek a cause elsewhere. Among the possibilities are pollution, pesticides, or drugs administered during birth. But the easiest target has been immunization.

From birth to 18 months, the United States Centers for Disease Control recommends that babies get 25 doses of vaccine,



sometimes in combination such as MMR (mumps, measles, and rubella) and DTaP (diphtheria, tetanus, and pertussis). As a result, when a parent first notices symptoms of autism, almost always she or he will remember a recent immunization.

Another correlation is evident: The rate of children diagnosed with autism spectrum disorders has risen dramatically over the past two decades, from about one child in a thousand to one in 88, and the number of vaccines has risen as well. Many parents are convinced that this proves causation.

No scientist who has examined the evidence agrees. But a decade ago, state legislators heeded the fears of their constituents to allow some parents to enroll their children in school without required immunization. Every U.S. state allows some parents to refuse to vaccinate their children for medical reasons (two states), for medical or religious reasons (29 states), or for medical, religious, or personal belief reasons (19 states).

Colorado and California have the most unvaccinated children (about 20 percent) and the highest rates of childhood diseases. In 2010, California had an epidemic of whooping cough (pertussis). Ten babies died (Seppa, 2014).

That horrifies some doctors and scientists (Offit, 2011). Immunization is a major reason that 99 percent of all infants in developed nations survive at least until adolescence, compared to the nineteenth century when half of all babies died. That also illustrates why the scientific method is so important.

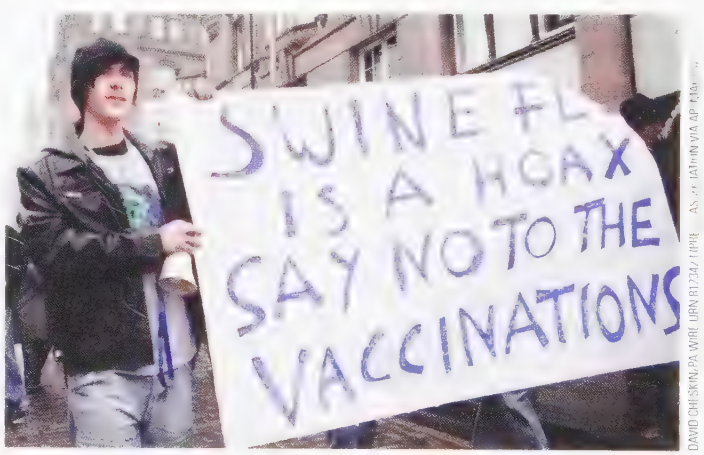
Fearful parents do not deserve all the blame. Almost twenty years ago, the leading medical journal in England (the *Lancet*) published a study of 12 children by a British doctor, linking the MMR to autism (Wakefield et al., 1998). A flurry of research followed, but his results were not replicated—quite the opposite.

By 2005, longitudinal, prospective, and retrospective studies of thousands of children in the United States, the United Kingdom, and Denmark found no correlation between vaccination and autism or any other disease (Andrews et al., 2004; Madsen et al., 2003; Institute of Medicine (U.S). Safety Review Committee, 2004). Since then, researchers confirmed that unvaccinated children are more likely to become seriously ill. The Wakefield study was "retracted," which means that the editors of the *Lancet* found such faulty data collection that the conclusions are invalid.

Sadly, that does not convince all the parents. Suspicion of science and of the federal government has led to suspicion of vaccination. Fortunately, infectious diseases spread slowly if most children are immunized, a phenomena called "herd immunity." As a result, even non-immunized children rarely contract diseases.

Unfortunately, if immunization rates fall lower than about 90 percent, social protection wanes. That explains why five times as many U.S. children had measles in 2014 than in the average of the previous 15 years. As fewer children are immunized, more will contract measles, chickenpox, mumps, or other preventable diseases. Even some immunized children will get sick, because no vaccine is always effective.

The other tragedy is that fewer research dollars will be spent on finding the genes and toxins that cause autism. Too many parents misunderstand correlation and causation, and then try to protect their own child while increasing the risk for everyone.



Truth or Dare Swine flu is rare but real, not a hoax. But if a vaccine prevents disease so people have no personal experience with it, and if people suspect anything from their federal government, then some individuals (like this man in Scotland, 2009) avoid the truth and take the dare—risking illness. Sadly, at Glasgow University in 2012, 39 students contracted mumps, which two doses of MMR for all babies would have prevented. Recent mumps epidemics in Scotland, England, California, and Iowa had doctors scrambling to find enough vaccine to immunize the children and young adults who were most vulnerable.

Ethics

The most important caution for all scientists, especially for those studying humans, is to uphold ethical standards in their research. Each academic discipline and every professional society involved in the study of human development has a

- **code of ethics** (a set of moral principles) delineating specific practices to protect the integrity of research.

Ethical standards and codes are increasingly stringent. In the United States, most educational and medical institutions have an *Institutional Review Board*

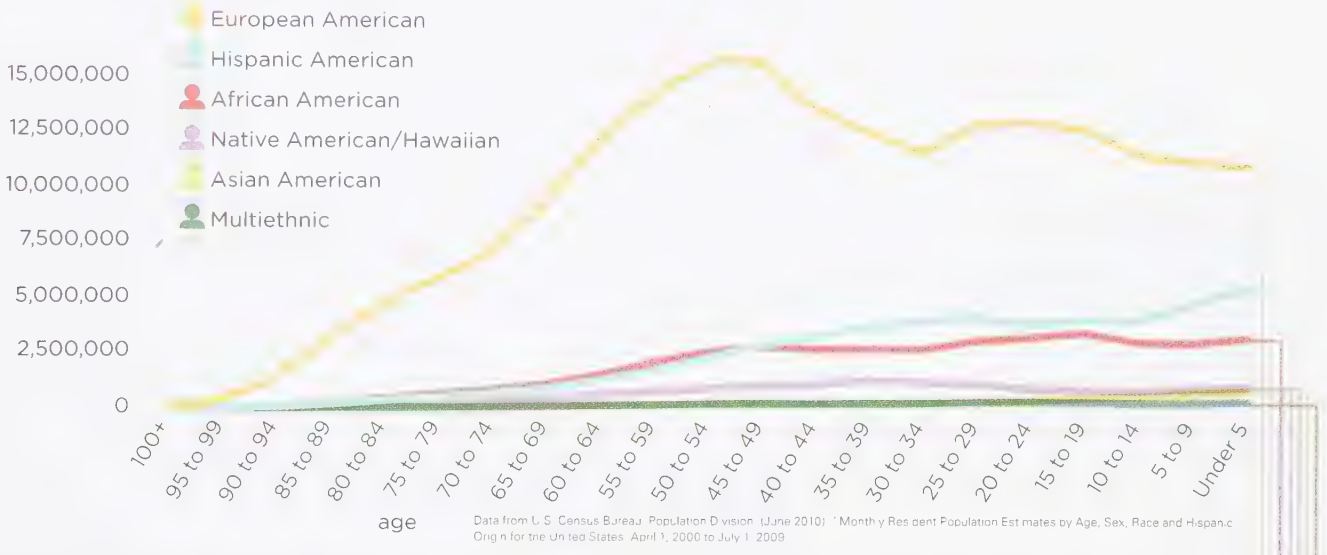
code of ethics A set of moral principles or guidelines that members of a profession or group are expected to follow

VISUALIZING DEVELOPMENT

Diverse Complexities

It is often repeated that "the United States is becominwg more diverse," a phrase that usually refers only to ethnic diversity and not to economic and religious diversity (which are also increasing and merit attention). From a developmental perspective, two other diversities are also important—age and region, as shown below. What are the implications for schools, colleges, employment, health care, and nursing homes in the notable differences in the ages of people of various groups? And are attitudes about immigration, or segregation, or multiracial identity affected by the ethnicity of one's neighbors?

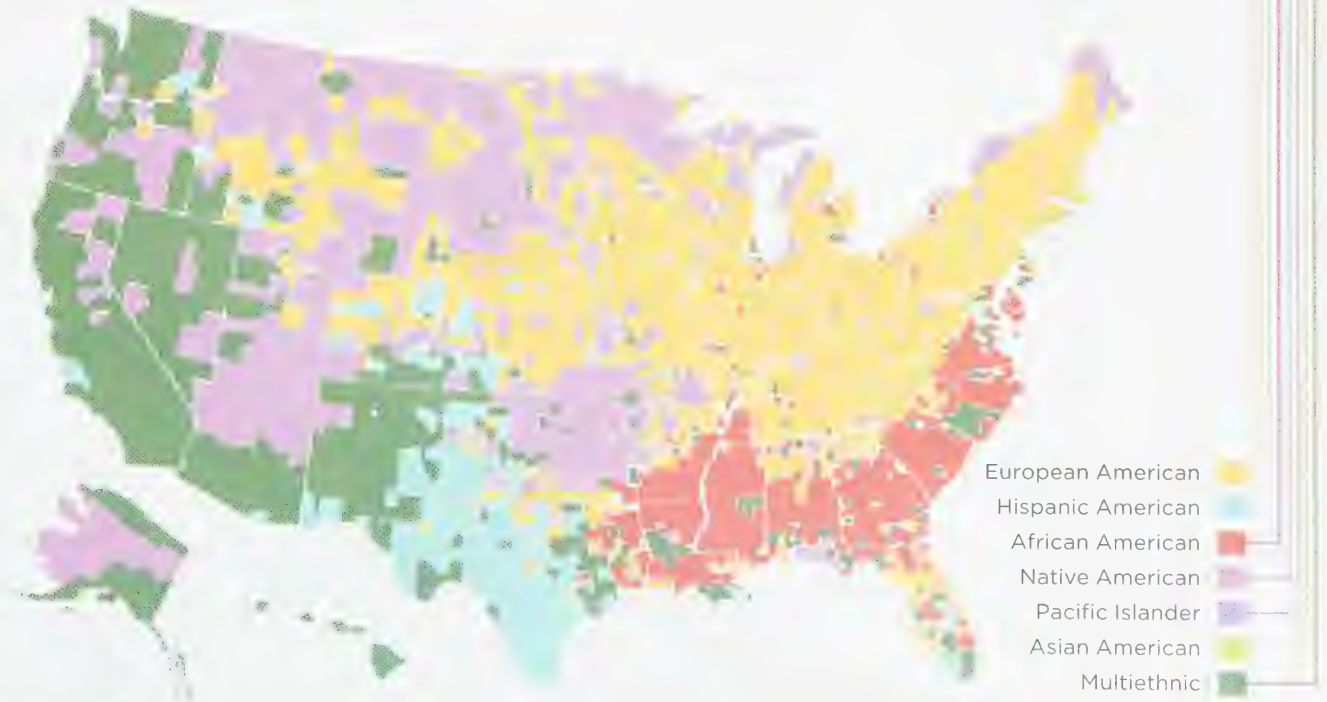
THE ETHNIC MAKE-UP OF THE UNITED STATES IS CHANGING DATA FROM 2000-2009



Data from U.S. Census Bureau, Population Division, (June 2010) "Monthly Resident Population Estimates by Age, Sex, Race and Hispanic Origin for the United States: April 1, 2000 to July 1, 2009."

REGIONAL DIFFERENCES IN ETHNICITY ACROSS THE UNITED STATES

In the United States, there are regional as well as age differences in ethnicity. This map shows which counties have an ethnic population greater than the national average. Counties where more than one ethnicity or race is greater than the national average are shown as multiethnic. Areas for which data are unavailable are left unshaded.



LaunchPad

Video Activity: Eugenics and the Feebleminded: A Shameful History illustrates what can happen when scientists fail to follow a code of ethics.

(IRB), a group that permits only research that follows certain guidelines. IRBs often slow down scientific study, but they are necessary: Some research conducted more than 50 years ago, before IRBs were established, was clearly unethical, especially when the participants were children, members of minority groups, prisoners, or animals (Blum, 2002; Washington, 2006).

Scientists—and everyone else—are horrified to learn about the Tuskegee study that did not treat people who had syphilis or the Little Albert research that taught an infant to fear white furry things. Details of these studies, and several others, continue to haunt current scientists, who follow many safeguards to make sure such moral lapses never happen again.

Protection of Research Participants

The most important safeguards are those that ensure no one is harmed by the study. Participation must be voluntary and confidential. This entails the *informed consent* of the participants—that is, they must understand and agree to the research procedures, knowing what risks are involved. For children, consent must be obtained from the parents as well, and the children must be allowed to end their participation at any time.

When the study is over, the participants must be "debriefed"—told what the study was about and what the results were.

Especially for Future Researchers and Science Writers Do any ethical guidelines apply when an author writes about the experiences of family members, friends, or research participants? (see response, page 34)

Integrity of Scientific Study

Scientists are obligated to "promote accuracy, honesty, and truthfulness" (American Psychological Association, 2010) in their methods and conclusions.

Deliberate falsification is unusual. When it does occur, it leads to ostracism from the scientific community, dismissal from a teaching or research position, and, sometimes, criminal prosecution. This occurred recently with Diederik Stapel, a Dutch social psychologist. He created data that was not actually collected. Unfortunately, he is one of several prominent scientists, in both the physical and the social sciences, who have committed fraud. Almost always, other scientists are the first to notice the deception and sound the alarm (W. Stroebe et al., 2012).

Another obvious breach of ethics is to "cook" the data, or distort one's findings, in order to make a particular conclusion seem to be the only reasonable one. This is not as rare as it should be. Tenure, promotion, and funding all encourage scientists to publish, and publishers seek remarkable findings. Awareness of this danger is leading to increased calls for replication (Carpenter, 2012).

Scientists are rewarded for publishing surprising results. When a hypothesis is not confirmed, that may lead to the "file drawer problem"; that is, a study is filed away and never published because the results are not exciting.

Ethical standards cannot be taken for granted. As stressed in the beginning of this chapter, researchers, like all other humans, have strong opinions, and they expect research to confirm their opinions. Therefore, sometimes without even realizing it, they might try to achieve the results they want. As one team explains:

> Our job as scientists is to discover truths about the world. We generate hypotheses, collect data, and examine whether or not the data are consistent with those hypotheses. . . . [But we] often lose sight of this goal, yielding to pressure to do whatever is justifiable to compile a set of studies we can publish. This is not driven by a willingness to deceive but by the self-serving interpretation of ambiguity. . . .
>
> *[Simmons et al., 2011, pp. 1359, 1365]*

Obviously, collaboration, replication, and transparency are essential ethical safeguards for all scientists.

Science as a Way to Help Humankind

Science can be a catalyst for social change, improving the lives of millions of people, as you will see often in this text. For example, the spread of preschool education, or the acceptance of children with disabilities, arose directly from research in child development.

In this chapter, changed attitudes about sexual orientation (page 22) and about marijuana (page 21) have followed new research on those topics. For both of these issues, and many others, the passions of people on opposite sides make evidence-based, unbiased studies especially needed—but these studies are not always available. For example, partly because marijuana has been illegal, two leaders fear that the current debates "are missing an essential piece of information: scientific evidence about the effects of marijuana on the adolescent brain" (DuPont & Lieberman, 2014, p. 557).

The ultimate purpose of the science of human development is to help "all kinds of people, everywhere, of every age" live satisfying and productive lives. Consider these questions:

- Do we know enough about prenatal drug use to protect every fetus?
- Do we know enough about poverty to enable everyone to be healthy?
- Do we know enough about various family structures to understand the impact on children of marriage, or divorce, or single parenthood?
- Do we know enough about television, video games, the Internet, and cell phones to use these to enhance learning, not harm children?

The answer to all these questions is a resounding *NO*. Few funders are eager to support scientific studies of drug abuse, poverty, nonstandard families, or technology, partly because people have strong opinions and economic motives that may conflict with scientific findings and conclusions.

The next cohort of developmental scientists will build on what is known, mindful of what needs to be explored, answering the questions just posed and many more. Remember that the goal is to help all 7 billion people on Earth fulfill their potential. Much more needs to be learned. The rest of this book is a start.

SUMMING UP Although science has improved human development in many ways, caution is needed in interpreting results and in designing research. Sometimes people think that correlation indicates cause. It does not.

Research on human development must subscribe to high ethical standards. Participants must be respected and must give informed consent. Political and publishing concerns can interfere with objective research. Scientists must study and report data on issues that affect the development of all people.

WHAT HAVE YOU LEARNED?

1. Why does correlation not prove causation?
2. Why do most colleges and hospitals have an IRB?
3. What are the primary ethical principles used when scientists study humans?
4. Why are some important questions about human development not yet answered?

SUMMARY

Understanding How and Why

1. The study of human development is a science that seeks to understand how people change or remain the same over time. As a science, it begins with questions and hypotheses and then uses various methods to gather empirical data.
2. Science needed to help humans thrive, although human judgment is always part of the process. For that reason, researchers draw conclusions based on empirical data. Then replication confirms, modifies, or refutes the conclusions of a scientific study.
3. The universality of human development and the uniqueness of each individual's development are both evident in nature (the genes) and nurture (the environment); no person is quite like another. Nature and nurture always interact, and each human characteristic is affected by that interaction.
4. Crucial to the study of nature and nurture is the concept of differential susceptibility—the idea that certain genes increase or decrease the likelihood that a child will be affected by the environment.
5. Within each person, every aspect of development interacts with the others, but it is useful to divide development into three domains – biosocial, cognitive, and psychosocial.

Including All Kinds of People

6. All kinds of people, of every age, culture, and background, are studied by developmental scientists. In studying human variations, one pitfall to avoid is the difference-equals-deficit error. Sexual orientation is an example of a difference that is assumed by some to be a deficit.
7. *Culture*, *ethnicity*, and *race* are social constructions, concepts created by society, that nonetheless have an impact on human development. Culture includes beliefs and patterns; ethnicity refers to ancestral heritage. Many social scientists prefer not to use that term "race" because it has been destructive.
8. Socioeconomic status (SES) is an important influence on human development, affecting a person's opportunities, health, and even abilities at every age. As with other differences among people, developmentalists seek to find the balance between recognizing similarities and respecting differences.

As Time Goes On

9. Time is a crucial variable in studying human development. A critical period is a time when something *must* occur to ensure normal development or the only time when an abnormality might occur. Many developments can occur more easily—but not exclusively—at a particular time, called a sensitive period.
10. Urie Bronfenbrenner's ecological-systems or bioecological approach notes that each child is situated within larger systems of family, school, community, and culture. Changes within a person, or changes in the context, affect all other aspects of the system.
11. Certain experiences or innovations shape people of each cohort because they are members of a particular generation who share the experience of significant historical events.
12. Throughout life, human development is plastic. *Plasticity* emphasizes that it is possible for individuals to change their characteristics and behavior as they develop, although it is also true that their childhood experiences affect later development.
13. A dynamic-systems approach to development emphasizes that change is ongoing, with each part of development affecting every other part. Continuity (sameness) and discontinuity (sudden shifts) are part of every life.

Using the Scientific Method

14. Commonly used research methods when studying people are scientific observation, the experiment, and the survey. Each can provide insight and discoveries, yet none are without flaws. Replication, or using another method to study the same topic is needed.
15. An additional challenge for developmentalists is to study change over time. Two traditional research designs are often used: cross-sectional research (comparing people of different ages) and longitudinal research (studying the same people over time).
16. Both traditional methods to study human develop have limitations. A better method may be cross-sequential research (combining the two other methods).

Cautions and Challenges from Science

17. A correlation shows that two variables are related. However, it does not prove that one variable *causes* the other: The relationship of variables may be opposite to the one expected, or both may be the result of a third variable.
18. Ethical behavior is crucial in all the sciences. Not only must participants be protected and data kept confidential (primary concerns of IRBs), but results must be fairly reported and honestly interpreted. Scientists must be mindful of the implications of their research.
19. Appropriate application of scientific research depends partly on the training and integrity of the scientists. The most important ethical question is whether scientists are designing, conducting, analyzing, publishing, and applying the research that is most critically needed.

Response for Future Researchers and Science Writers (from page 32) Yes. Anyone you write about must give consent and be fully informed about your intentions. They can be identified by name only if they give permission. For example, family members gave permission before anecdotes about them were included in this text. My nephew David read the first draft of his story (see page 21) and is proud to have his experiences used to teach others.

KEY TERMS

science of human development (p. 4)
scientific method (p. 4)
theory (p. 4)
hypothesis (p. 4)
empirical (p. 4)
replication (p. 5)
nature (p. 5)
nurture (p. 5)
differential sensitivity (p. 6)
difference-equals-deficit error (p. 10)
social construction (p. 11)
culture (p. 11)
ethnic group (p. 12)
race (p. 13)
socioeconomic status (SES) (p. 14)
critical period (p. 16)
sensitive period (p. 17)
ecological-systems approach (p. 17)
cohort (p. 19)
plasticity (p. 20)
dynamic-systems approach (p. 20)
scientific observation (p. 23)
experiment (p. 23)
independent variable (p. 23)
dependent variable (p. 24)
survey (p. 24)
case study (p. 24)
cross-sectional research (p. 26)
longitudinal research (p. 26)
cross-sequential research (p. 27)
correlation (p. 28)
code of ethics (p. 30)

APPLICATIONS

1. It is said that culture is pervasive but that people are unaware of it. List 30 things you did *today* that you might have done differently in another culture. Begin with how, when, and where you woke up.
2. How would your life be different if your parents were much higher or lower in SES than they are? Consider all three domains.
3. Design an experiment to answer a question you have about human development. Specify the question and the hypothesis and then describe the experiment. How would you prevent your conclusions from being biased and subjective?
4. A longitudinal case study can be insightful but is also limited in generality. Describe the life of one of your older relatives, explaining what aspects of their development are unique and what aspects might be relevant for everyone.



CHAPTER 2

Theories



1. How does a theory differ from a fact?
2. In what ways did Erikson disagree with his mentor, Freud?
3. Why do children often copy their parents' habits and prejudices?
4. Do people sometimes act on thoughts that are not true?
5. Does what a child learns depend on what culture he or she experiences?
6. Do all humans strive for the same goals?
7. Why is it better to use several theories to understand human development rather than just one?

- What Theories Do
  - Questions and Answers
  - Facts and Norms
- Psychoanalytic Theory: Freud and Erikson
  - Freud's Ideas
  - Erikson's Ideas
- Behaviorism: Conditioning and Social Learning
  - Classical Conditioning
  - Operant Conditioning
  - Social Learning
- Cognitive Theory: Piaget and Information Processing
  - Piaget's Stages of Development
  - Information Processing
  - OPPOSING PERSPECTIVES: Toilet Training—How and When?
- Sociocultural Theory: Vygotsky and Beyond
  - Social Interaction
  - The Zone of Proximal Development
  - Taking Culture into Account
- The Universal Perspective Humanism and Evolution
  - Humanism
  - Evolutionary Theory
  - A VIEW FROM SCIENCE: If Your Mate Were Unfaithful
- What Theories Contribute

According to many news reports (Goodman, 2012; Pearce, 2012), Larry DePrimo, a 25-year-old police officer on duty in Times Square, saw a barefoot man on a frigid November night, asked his shoe size (12), and bought him all-weather boots and thermal socks. As DePrimo bent down to help the man don his gift, a tourist from Arizona snapped his photo. Days later, the tourist wrote to the New York Police Department, who put the image on their website. It went viral.

Then came theories.

Commentators asked: Was this real or a hoax? Was DiPrimo's act typical ("most cops are honorable, decent people"), atypical ("truly exceptional"), or in between ("not all NYC cops are short-tempered, profiling, or xenophobic")? Is the officer young and naïve, are his parents proud and wonderful, was his assignment (anti-terrorism patrol) neglected or boring?

These questions reflect not science but "folk theories," which arise from preconceptions and everyday experience (Bazinger & Kühberger, 2012). Nonetheless, this anecdote illustrates three aspects shared by all theories, scientific as well as folk: (1) behavior can be surprising, (2) humans develop theories to explain everything, and (3) experience and culture matter.

Regarding theories of this incident, past experience is particularly apparent: An advocate for the homeless suspected that the photo was staged; the tourist was reminded of her father, also a police officer; many commentators used this event to criticize someone, among them New York City's mayor (for not helping the poor), the police (for harassing the homeless), journalists (for focusing "on murder and mayhem"), or the barefoot man himself (for choosing his plight). A year later, DePrimo was promoted; his father, responding to more speculation, said his service record was the reason, not the boots (Antenucci, 2013).



AP PHOTO/NEWS + ILK PHOTO/HIPARION, NY

Badge and Boots This is Larry DePrimo, a police officer in Manhattan, who astonished everyone when he bought boots for a barefoot man on a cold afternoon.

developmental theory A group of ideas, assumptions, and generalizations that interpret and illuminate the thousands of observations that have been made about human growth. A developmental theory provides a framework for explaining the patterns and problems of development.

In this chapter, we explain several of the most insightful theories of human development. Because they are comprehensive and complex, they propel science forward, inspiring thousands of scientists to experiment and explain. These theories share with all theories the three characteristics just listed, but unlike folk theories, they lead to new insights and alternate interpretations.

Simple pronouncements regarding one incident are relatively easy to prove or disprove. DePrimo is from my local precinct; I know his commanding officer, who praised him. This was not a hoax.

What Theories Do

Every theory is an explanation of facts and observations, a set of concepts and ideas that organize the confusing mass of experiences that each of us encounters every minute. Some theories are idiosyncratic, narrow, and useless to anyone except the people who thought of them. Others are much more elaborate and insightful, such as the major theories described in this chapter.

A **developmental theory** is a systematic statement of general principles that provides a framework for understanding how and why people change as they grow older. Facts and observations are connected to patterns of change and explanations, weaving the details into a meaningful whole. A developmental theory is more than a hunch or a hypothesis, and is far more comprehensive than a folk theory. Developmental theories provide insights that are both broad and deep.

Kurt Lewin (1943) once quipped, "Nothing is as practical as a good theory." Like many other scientists, he knew that theories can be insightful. Of course, theories differ; some are less comprehensive or adequate than others, some are no longer useful, and some reflect one culture but not another.

Questions and Answers

As we saw in Chapter 1, the first step in the science of human development is to pose a question, which often springs from a developmental theory. Among the thousands of important questions are the following, each central to one of the five theories described in this chapter:

1. Does the impact of early experience—of breast-feeding or attachment or abuse—linger into adulthood, even if the experience seems to be forgotten?
2. Does learning depend on specific encouragement, punishment, and/or role models?
3. Do children develop morals, even if they are not taught right from wrong?
4. Does culture guide parents' behavior, such as how they react to a child's cry?
5. Is survival an inborn instinct, underlying all personal and social decisions?

Each of these five questions is answered "yes" by, in order, psychoanalytic theory, behaviorism, cognitive theory, sociocultural theory, and the two universal theories, humanism and evolutionary theory. Each question is answered "no" or "not necessarily" by several others. For every answer, more questions arise: Why or why not? When and how? So what? This last question is crucial; the implications and applications of the answers affect everyone's daily life.

To be more specific about what theories do:

- Theories produce *hypotheses*.
- Theories generate *discoveries*.
- Theories offer *practical guidance*.

Facts and Norms

A **norm** is an average or usual event or experience. It is related to the word "normal," although it has a slightly different meaning. Something can be outside the norm, but that does not make it abnormal.

norm An average, or typical, standard of behavior or accomplishment, such as the norm for age of walking or the norm for greeting a stranger.

To be abnormal implies that something is wrong, but norms are neither right nor wrong. A norm is an average—not an arithmetical mean or median, but a mode, a common behavior. Thus, norms can be calculated (such as the norm for the age at which babies walk or children read), but, as you learned in Chapter 1, differences from the norm are not necessarily deficits.

For example, it is not the norm for police officers to spend their own money to buy boots for strangers, which is why DePrimo's act generated headlines. But his act would not be called abnormal.

Do not confuse theories with norms or facts. Theories raise questions and suggest hypotheses, and they lead to research to gather empirical data. Those data are facts that suggest conclusions, which may verify or refute some aspect of the theory; however, other interpretations of the data and new research to investigate the theory are always possible.

Obviously, the scientific method is needed because "each theory of developmental psychology always has a view of humans that reflects philosophical, economic, and political beliefs" (Miller, 2011, p. 17). A theory can begin the process, but then scientists develop hypotheses, design studies, and collect and analyze data that lead to conclusions that undercut some theories and modify others. (**Developmental Link:** These five steps are explained in Chapter 1.)

Humans spontaneously develop theories about everything they observe. Some theories are better than others. Developmental theories are very useful: Without them, we would be merely reactive and bewildered, adrift and increasingly befuddled, blindly following our culture and our prejudices, less able to help anyone with a developmental problem.





Backpacks or Bouquets? Children worldwide are nervous on the first day of school, but their coping reflects implicit cultural theories. Kindergartener Madelyn Ricker in Georgia shows her new backpack to her teacher, and elementary school children in Russia bring flowers to their teachers.

SUMMING UP Theories provide a framework for organizing and understanding the thousands of observations we make and the daily behaviors that occur in every aspect of development. Theories are not facts, but they allow us to question norms, suggest hypotheses, and provide guidance. Thus, theories are practical and applied: They help us frame and organize our millions of experiences.

WHAT HAVE YOU LEARNED?

1. What three things do theories do?
2. What is the difference between a theory and a norm?
3. What is the relationship between theories and facts?

Psychoanalytic Theory: Freud and Erikson

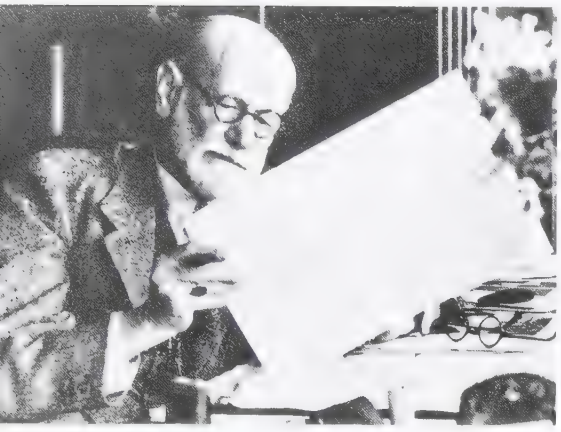
psychoanalytic theory A grand theory of human development that holds that irrational, unconscious drives and motives, often originating in childhood, underlie human behavior

Inner drives, deep motives, and unconscious needs rooted in childhood—especially in experiences in the first six years—form the foundation of **psychoanalytic theory.** These basic underlying forces are thought to influence every aspect of thinking and behavior, from the smallest details of daily life to the crucial choices of a lifetime.

Freud's Ideas

Psychoanalytic theory originated with Sigmund Freud (1856–1939), an Austrian physician who treated patients suffering from mental illness. He listened to their remembered dreams and to their uncensored streams of thought, and he constructed an elaborate, multifaceted theory. Much of it concerns child development.

According to Freud, development in the first six years of life occurs in three stages, each characterized by sexual interest and pleasure arising from a particular part of the body. In infancy the erotic body part is the mouth (the *oral stage*). In early childhood it is the anus (the *anal stage*). In the preschool years it is the penis (the *phallic stage*), a source of pride and fear among boys and a reason for sadness and envy among girls. Then, after a quiet period (*latency*), the *genital stage* arrives at puberty, lasting throughout adulthood. (Table 2.1 describes stages in Freud's theory.)



Freud at Work In addition to being the world's first psychoanalyst, Sigmund Freud was a prolific writer. His many papers and case histories, primarily descriptions of his patients' symptoms and sexual urges, helped make the psychoanalytic perspective a dominant force for much of the twentieth century

Freud maintained that sensual pleasure (from stimulation of the mouth, anus, or penis) is linked to major developmental stages, needs, and challenges. During the oral stage, for example, sucking provides not only nourishment but also erotic joy and attachment to the mother. Kissing in adulthood is a vestige of the oral stage. Next, during the anal stage, pleasures arise from self-control, initially with toileting.

One of Freud's most influential ideas was that each stage includes its own struggles. Conflict occurs, for instance, when mothers try to wean their babies (oral stage), toilet train their toddlers (anal stage), deflect the sexual curiosity and fantasies of their 5-year-olds (phallic stage), and limit the sexual interests of adolescents (genital stage). According to Freud, how children experience and resolve



No Choking During the oral stage, children put everything in their mouths, as Freud recognized and as 12-month-old Harper Vasquez does here. Toy manufacturers and lawyers know this too, which is why many [illegible] packages say "Choking hazard: small [illegible] appropriate for children under [illegible]

Table 2.1 Comparison of Freud's Psychosexual and Erikson's Psychosocial Stages

Approximate Age	Freud (Psychosexual)	Erikson (Psychosocial)
Birth to 1 year	*Oral Stage* The lips, tongue, and gums are the focus of pleasurable sensations in the baby's body, and sucking and feeding are the most stimulating activities.	*Trust vs. Mistrust* Babies either trust that others will satisfy their basic needs, including nourishment, warmth, cleanliness, and physical contact, **or** develop mistrust about the care of others.
1–3 years	*Anal Stage* The anus is the source of pleasure in the baby's body, and toilet training is the most important activity.	*Autonomy vs. Shame and Doubt* Children either become self-sufficient in many activities, including toileting, feeding, walking, exploring, and talking, **or** doubt their own abilities.
3–6 years	*Phallic Stage* The phallus, or penis, is the most important body part, and pleasure comes from genital stimulation. Boys are proud of their penises; girls wonder why they don't have them.	*Initiative vs. Guilt* Children either try to undertake many adultlike activities **or** internalize the limits and prohibitions set by parents. They feel either adventurous **or** guilty.
6–11 years	*Latency* Not really a stage, latency is an interlude. Sexual needs are quiet; psychic energy flows into sports, schoolwork, and friendship.	*Industry vs. Inferiority* Children busily practice and then master new skills **or** feel inferior, unable to do anything well.
Adolescence	*Genital Stage* The genitals provide pleasurable sensations. The young person seeks sexual stimulation and satisfaction in heterosexual relationships.	*Identity vs. Role Confusion* Adolescents ask themselves "Who am I?" They establish sexual, political, religious, and vocational identities **or** are confused about their roles.
Adulthood	Freud believed that the genital stage lasts throughout adulthood. He also said that the goal of a healthy life is "to love and to work."	*Intimacy vs. Isolation* Young adults seek companionship and love **or** become isolated from others, fearing rejection. *Generativity vs. Stagnation* Adults contribute to future generations through work, creative activities, and parenthood **or** they stagnate. *Integrity vs. Despair* Older adults try to make sense of their lives, either seeing life as a meaningful whole **or** despairing at goals never reached.

these conflicts determines personality lifelong because "the early stages provide the foundation for adult behavior" (Salkind, 2004, p. 125).

Freud did not believe that new stages occurred after puberty; rather, he believed that adult personalities and habits were influenced by what happened in childhood. Unconscious conflicts rooted in early life may be evident in adult behavior—for instance, smoking cigarettes (oral) or keeping a clean and orderly house (anal) or falling in love with a much older partner (phallic).

Erikson's Ideas

Many of Freud's followers became famous theorists themselves, Carl Jung, Alfred Adler, and Karen Horney among them. They acknowledged the importance of the unconscious and of early childhood experience, but each of them expanded and modified Freud's ideas. For scholars in child development, one neo-Freudian, Erik Erikson (1902–1994), is the most insightful. He proposed a comprehensive developmental theory.

Erikson described eight developmental stages, each characterized by a particular challenge, or *developmental crisis* (summarized in Table 2.1). Although Erikson named two polarities at each crisis, he recognized a wide range of outcomes



TED STRESHINSKY/CONTRIBUTOR / GETTY IMAGES

A Legendary Couple In his first 30 years, Erikson never fit into a particular local community, since he frequently changed nations, schools, and professions. Then he met Joan. In their first five decades of marriage, they raised a family and wrote several books. If he had published his theory at age 73 (when this photograph was taken) instead of in his 40s, would he still have described life as a series of crises?

Especially for Teachers Your kindergartners are talkative and always moving. They almost never sit quietly and listen to you. What would Erik Erikson recommend? (see response, page 44)

between those opposites. Typically, development at each stage leads to neither extreme but to something in between.

In the stage of *initiative versus guilt*, for example, 3- to 6-year-olds undertake activities that exceed the limits set by their parents and culture. They jump into swimming pools, pull their pants on backwards, make cakes according to their own recipes, and wander off alone. Efforts to act independently produce the child's feelings of pride or failure and then lifelong guilt if adults are too critical or if social norms are too strict. Decades later, most adults fall somewhere between unbridled initiative and crushing guilt, depending on their early childhood experiences.

As you can see from Table 2.1, Erikson's first five stages are closely related to Freud's stages. Erikson, like Freud, believed that problems of adult life echo unresolved childhood conflicts. He thought the first stage, *trust versus mistrust*, was particularly crucial. For example, an adult who has difficulty establishing a secure, mutual relationship with a life partner may never have resolved that first crisis of early infancy, trust versus mistrust.

Every stage echoes throughout life. For instance, in late adulthood, one older person may be outspoken while another avoids saying anything because each resolved the initiative-versus-guilt stage in opposite ways.

In two crucial aspects, Erikson's stages differ significantly from Freud's:

1. Erikson's stages emphasized family and culture, not sexual urges.
2. Erikson recognized adult development, with three stages after adolescence.

SUMMING UP Both Freud and Erikson thought unconscious drives and early experiences form later personality and behavior, but they differed on the origins of those drives and experiences. Freud believed development depended on three psychosexual stages that impacted later habits and personality, not only in the next two periods (latency and genital) but lifelong. Conflict between the child's impulses and the parents' restrictions was inevitable, forming personality. On the other hand, Erikson's eight psychosocial stages were characterized by developmental crises resolved through the individual's relationship to family, and culture, a process that continued lifelong.

WHAT HAVE YOU LEARNED

1. What is the basic idea of psychoanalytic theory?
2. What body parts are connected to the oral, anal, and phallic stages?
3. Which psychosocial stage did Erikson believe was a foundation for all later relationships?
4. In what two ways does Erikson's theory differ from Freud's?



A Conventional Couple The identity crisis looks like a rejection of social norms, from her multicolored hair to his two-color pants. But Erikson noted that underlying the crisis is the wish to find another teenager who shares the same identity—as these two have done

Behaviorism: Conditioning and Social Learning

Another comprehensive theory arose in direct opposition to the psychoanalytic notion of the unconscious. John B. Watson (1878–1958) argued that if psychology was to be a true science, psychologists should examine only what they could see and measure: behavior, not irrational thoughts and hidden urges. In his words:

> Why don't we make what we can *observe* the real field of psychology? Let us limit ourselves to things that can be observed, and formulate laws concerned only with those things. . . . We can observe behavior—what the organism does or says.
>
> *[Watson, 1998, p. 6]*

According to Watson, if psychologists focus on behavior, they will realize that everything can be learned. He wrote:

> Give me a dozen healthy infants, well-formed, and my own specified world to bring them up in and I'll guarantee to take any one at random and train him to become any type of specialist I might select—doctor, lawyer, artist, merchant-chief, and yes, even beggar-man and thief, regardless of his talents, penchants, tendencies, abilities, vocations, and race of his ancestors.
>
> *[Watson, 1998, p. 82]*

Other psychologists, especially in the United States, agreed. They developed **behaviorism** to study observable behavior, objectively and scientifically. Behaviorism is also called *learning theory* because it describes the learning process.

For everyone at every age, behaviorists believe there are natural laws of human behavior. Those laws allow simple actions to become complex competencies, as various forces in the environment affect each action. Learning is far more than an academic skill, such as learning to read. It includes learning to suck on a nipple, learning to smile at a caregiver, learning to hold hands when crossing the street, and so on.

Learning theorists believe that development occurs not in stages but bit by bit. A person learns to talk, read, or anything else one tiny step at a time. Behaviorists study **conditioning,** the processes by which responses link to particular stimuli. In the first half of the twentieth century, behaviorists described only two types of conditioning: classical and operant. Both are still described in parenting-advice books.



THE DRS. NICOLAS AND DOROTHY CUMMINS CENTER FOR THE HISTORY OF PSYCHOLOGY, THE UNIVERSITY OF AKRON

An Early Behaviorist John Watson was an early proponent of learning theory. His ideas are still influential and controversial today.

behaviorism A grand theory of human development that studies observable behavior. Behaviorism is also called *learning theory* because it describes the laws and processes by which behavior is learned.

conditioning According to behaviorism, the processes by which responses become linked to particular stimuli and learning takes place. The word *conditioning* is used to emphasize the importance of repeated practice, as when an athlete *conditions* his or her body.

classical conditioning The learning process in which a meaningful stimulus (such as the smell of food to a hungry animal) is connected with a neutral stimulus (such as the sound of a tone) that had no special meaning before conditioning. (Also called *respondent conditioning.*)

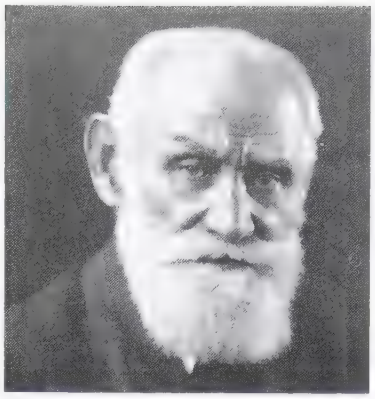
Classical Conditioning

A century ago, Russian scientist Ivan Pavlov (1849–1936), after winning the Nobel Prize for his work on animal digestion, examined the link between stimulus and response. While studying salivation, Pavlov noted that his experimental dogs drooled not only at the smell of food but also, eventually, at the sound of the footsteps of the people bringing food. This observation led Pavlov to perform a famous experiment: He conditioned dogs to salivate when hearing a particular noise.

Pavlov began by sounding a tone just before presenting food. After a number of repetitions of the tone-then-food sequence, dogs began salivating at the sound even when there was no food. This simple experiment demonstrated **classical conditioning** (also called *respondent conditioning*).

In classical conditioning, a person or animal learns to associate a neutral stimulus with a meaningful stimulus, gradually responding to the neutral stimulus in the same way as to the meaningful one. In Pavlov's original experiment, the dog associated the tone (the neutral stimulus) with food (the meaningful stimulus) and eventually responded to the tone as if it were the food itself. The conditioned response to the tone, no longer neutral but now a conditioned stimulus, was evidence that learning had occurred.

Behaviorists see dozens of examples of classical conditioning in child development. Infants learn to smile at their parents because they associate them with food and play; toddlers become afraid of busy streets if the noise of traffic repeatedly frightens them; students enjoy—or fear—school, depending on what happened in kindergarten.


© HULTON-DEUTSCH COLLECTION/CORBIS

A Contemporary of Freud Ivan Pavlov was a physiologist who received the Nobel Prize in 1904 for his research on digestive processes. It was this line of study that led to his discovery of classical conditioning, when his research on dog saliva led to insight about learning.

One specific example of classical conditioning is called the *white coat syndrome*, which occurs in people for whom past experiences with medical professionals (who wore white coats) conditioned anxiety. For that reason, when someone dressed in white takes their blood pressure, it is higher than it would be under normal circumstances.

White coat syndrome is apparent in about half of the U.S. population over age 80 (Bulpitt et al., 2013). It began when those elders were children. Today many nurses, especially in pediatrics, wear colorful blouses and many doctors wear street clothes: They dress to prevent conditioned anxiety.

OBSERVATION QUIZ In appearance, how is Pavlov similar to Freud, and how do both look different from the other theorists pictured? (see answer, page 46)

Operant Conditioning

The most influential North American proponent of behaviorism was B. F. Skinner (1904–1990). Skinner agreed that psychology should focus on the science of behavior. He did not dispute Pavlov's classical conditioning, but, as a good scientist, he built on Pavlov's conclusions with his own experiments. His most famous contribution was to recognize another type of conditioning—**operant conditioning** (also called *instrumental conditioning*)—in which animals (including people) act and then something follows that action.

operant conditioning The learning process by which a particular action is followed by something desired (which makes the person or animal more likely to repeat the action) or by something unwanted (which makes the action less likely to be repeated). (Also called *instrumental conditioning.*)

In other words, he went beyond observation of learning by association, in which one stimulus is paired with another stimulus (in Pavlov's experiment, the tone with the food). He focused instead on what happens *after* a behavior elicits a particular response. If the consequence that follows is enjoyable, the animal tends to repeat the behavior; if the consequence is unpleasant, the animal might not. Usually, operant conditioning occurs only after several repetitions of an action that result in similar consequences.

// Response for Teachers (from page 42) Erikson would note that the behavior of 5-year-olds is affected by their developmental stage and by their culture. Therefore, you might design your curriculum to accommodate active, noisy children.

Pleasant consequences are sometimes called *rewards*, but behaviorists do not call them that because what some people consider a reward may actually be a punishment, an unpleasant consequence. For instance, some teachers think they are rewarding children by giving them more recess time, but some children may hate the social pressures of recess.

The opposite is true as well: Something thought to be a punishment may actually be a positive consequence. For example, parents think they punish their children by withholding dessert. But a particular child might dislike the dessert, so being deprived of it is no punishment.

Sometimes teachers send misbehaving children out of the classroom and principals suspend them from school. However, if a child hates the teacher, leaving class is rewarding, and if a child hates school, suspension is a reward. Indeed, research on school discipline finds that some measures, including school suspension, *increase* later misbehavior (Osher et al., 2010).



Rats, Pigeons, and People B. F. Skinner is best known for his experiments with rats and pigeons, but he also applied his knowledge to human behavior. For his daughter, he designed a glass-enclosed crib in which temperature, humidity, and perceptual stimulation could be controlled to make her time in the crib enjoyable and educational. He encouraged her first attempts to talk by smiling and responding with words, affection, or other positive reinforcement.

In order to stop misbehavior, it is more effective to encourage good behavior, to "catch them being good." Three times as many African American children are suspended as European American children, even though white children are the majority in schools. The statistics on school discipline raise a troubling question: Is suspension a punishment for the child, or is it a reward for the teacher? Or even a sanctioned expression of racism (Tajalli & Garba, 2014; Shah, 2011)?

The true test is the *effect* a consequence has on the individual's future actions, not whether it is intended to be a reward or a punishment. A child, or an adult, who repeats an offense may have been reinforced, not punished, for the first infraction.

Consequences that increase the frequency or strength of a particular action are called reinforcers, in a process called **reinforcement** (Skinner, 1953). According to behaviorism, almost all of our daily behavior, from saying "Good morning" to earning a paycheck, can be explained as the result of past reinforcement.

Especially for Teachers Same problem as previously (talkative kindergartners), but what would a behaviorist recommend? (see response, page 47)

Social Learning

At first, behaviorists thought all behavior arose from a chain of learned responses, the result of either the association between one stimulus and another (classical conditioning) or of past reinforcement (operant conditioning). Thousands of experiments inspired by learning theory have demonstrated that both classical conditioning and operant conditioning occur often as children grow.

However, research finds that people at every age are social and active, not just reactive. Instead of responding merely to their own direct experiences, "people act on the environment. They create it, preserve it, transform it, and even destroy it . . . in a socially embedded interplay" (Bandura, 2006, p. 167).

That social interplay is the foundation of **social learning theory** (see Table 2.2), which holds that humans sometimes learn without personal reinforcement. This learning often occurs through **modeling,** when people copy what they see others do (also called *observational learning*). However, modeling is not simple imitation, and some people are more likely to be followed as roles models than others. Indeed, people model only some actions, of some individuals, in some contexts, and sometimes they do the opposite of what they have observed.

Generally, modeling is most likely to occur when the observer is uncertain or inexperienced (which explains why modeling is especially powerful in childhood) and when the model is admired, powerful, nurturing, or similar to the observer (Bandura, 1986, 1997).



JON BRENNEIS, © MAGAZINE/THE LIFE IMAGES COLLECTION/GETTY IMAGES

Still Social Learning This photo shows Bandura in middle age, but even in his 80s, he is on the faculty at Stanford University. As a proponent of social learning, he believes he still can influence students and faculty.

reinforcement When a behavior is followed by something desired, such as food for a hungry animal or a welcoming smile for a lonely person.

social learning theory An extension of behaviorism that emphasizes the influence that other people have over a person's behavior. Even without specific reinforcement, every individual learns through observation and imitation of other people. (Also called *observational learning.*)

modeling The central process of social learning, by which a person observes the actions of others and then copies them.

Table 2.2 Three Types of Learning

Behaviorism is also called *learning theory* because it emphasizes the learning process, as shown here.

Type of Learning	Learning Process	Result
Classical Conditioning	Learning occurs through association.	Neutral stimulus becomes conditioned response.
Operant Conditioning	Learning occurs through reinforcement and punishment.	Weak or rare responses become strong, frequent responses. Or, with punishment, unwanted responses become extinct.
Social Learning	Learning occurs through modeling what others do.	Observed behaviors become copied behaviors.



LAURIE SWOPE, AURORA OPEN/GETTY IMAGES

Learning to Be a Dad Note how the 2-year-old angles the bottle and the doll's body, just as his father does. Even his left hand, gentle on the head, shows that he is learning how to be a good father from watching his dad.

Social learning is particularly noticeable in early adolescence, when children want to be similar to their peers despite their parents' wishes. That impulse may continue into adulthood. Is your speech, hairstyle, or choice of shoes similar to those of your peers, or of an entertainer, or a sports hero? Why?

LaunchPad



FOOTAGE BY DR. ALBERT BANDURA

Video Activity: Modeling: Learning by Observation features the original footage of Bandura's famous experiment.

SUMMING UP Unlike Freud and Erikson, behaviorists emphasize that psychologists should study what can be observed and measured, not the unconscious. Behaviorists also thought that every behavior is the product of learning, and they set out to understand the laws of learning. Pavlov's experiment with dogs (classical conditioning) and Skinner's experiments with rats and pigeons (operant conditioning) demonstrated that learning is a lifelong process that guides human behavior. Social learning theorists extended behaviorism to include learning through the observation and imitation (modeling) of other people.

WHAT HAVE YOU LEARNED?

1. What is the basic idea of behaviorism?
2. How does the way a nurse or doctor dress illustrate classical conditioning?
3. In operant conditioning, why is a reinforcement different from what people often call a reward?
4. According to social learning, how do people choose their role models?

Cognitive Theory: Piaget and Information Processing

Social scientists sometimes write about the "cognitive revolution," which occurred in about 1980 when psychoanalytic and behaviorist research and therapy were overtaken by a focus on cognition. That does not mean that behaviorism and psychoanalysis are no longer relevant: The cognitive revolution adds another aspect to our understanding of children without demolishing previous conceptions of development (Watrin & Darwich, 2012).

ANSWER TO OBSERVATION QUIZ (from page 44) Both are balding, with white beards. Note also that none of the other theorists in this chapter have beards—a cohort difference, not an ideological one

According to **cognitive theory,** thoughts and expectations profoundly affect attitudes, beliefs, values, assumptions, and actions. This revolution was the result of an increasing awareness of the power of the mind. Cognitive theory dominated psychology for decades, becoming a grand theory.

cognitive theory A grand theory of human development that focuses on changes in how people think over time. According to this theory, our thoughts shape our attitudes, beliefs, and behaviors.

Piaget's Stages of Development

The first major cognitive theorist was the Swiss scientist Jean Piaget (1896–1980), considered by many "the greatest developmental psychologist of all time" (Haidt, 2013, p. 6). Piaget's academic training was in biology, with a focus on shellfish—a background that taught him to look very closely at small details. He became interested in human thought when he was hired to standardize an IQ test by noting at what age children answered each question correctly.

Although he did his job, noting when children knew, for example, that a bicycle had two wheels and a hand had five fingers, it was the children's wrong answers that intrigued him. *How* children think is much more revealing, Piaget concluded, than *what* they know.

In the 1920s, most scientists believed that babies could not yet think. But Piaget used scientific observation with his own three infants, finding them curious and thoughtful.

Later he studied hundreds of schoolchildren. From this work, Piaget formed the central thesis of cognitive theory: How children think changes with time and experience, and their thought processes affect their behavior. According to cognitive theory, to understand humans of any age, one must understand intellectual processes.



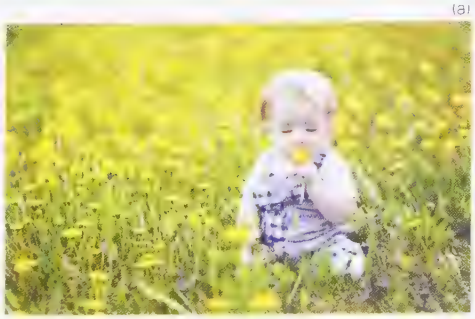
Would You Talk to This Man? Children loved talking to Jean Piaget, and he learned by listening carefully—especially to their incorrect explanations, which no one before Piaget had paid much attention to. All his life, Piaget studied the way children think.

Piaget maintained that cognitive development occurs in four age-related periods, or stages: *sensorimotor, preoperational, concrete operational,* and *formal operational* (see Table 2.3). Each period fosters certain cognitive processes: Infants

How to Think About Flowers A person's stage of cognitive growth influences how he or she thinks about everything, including flowers. (a) To an infant, in the sensorimotor stage, flowers are "known" through pulling, smelling, and even biting. (b) At the concrete operational stage, children become more logical. This boy can understand that flowers need sunlight, water, and time to grow. (c) At the adult's formal operational stage, flowers can be part of a larger, logical scheme—for instance, to earn money while cultivating beauty. As illustrated by all three photos, thinking is an active process from the beginning of life until the end.

// Response for Teachers (from page 45) Behaviorists believe that anyone can learn anything. If your goal is quiet, attentive children, begin by reinforcing a moment's quiet or a quiet child, and soon all the children will be trying to remain quietly attentive for several minutes at a time.

(a)



(b)



(c)



think via their senses, preschoolers have language but not logic, school-age children have simple logic. Finally, formal, abstract reasoning becomes possible at puberty (Inhelder & Piaget, 1958/2013b; Piaget, 1952/2011).

Piaget found that intellectual advancement occurs because humans at every age seek **cognitive equilibrium**—a state of mental balance. The easiest way to achieve this balance is to interpret new experiences through the lens of preexisting ideas. For example, infants grab new objects in the same way that they grasp familiar objects, a child's first concept of God is as a loving—or punishing—parent, and at every age, children interpret their parents' behavior by assuming everyone thinks in the same way that they themselves do.

cognitive equilibrium In cognitive theory, a state of mental balance in which people are not confused because they can use their existing thought processes to understand current experiences and ideas.

Achieving equilibrium is not always easy, however. Sometimes a new experience or question is jarring or incomprehensible. Then the individual experiences *cognitive disequilibrium*, an imbalance that creates confusion. As Figure 2.1 illustrates, disequilibrium can cause cognitive growth if people adapt their thinking. Piaget describes two types of cognitive adaptation:

- **Assimilation:** New experiences are reinterpreted to fit, or *assimilate*, into old ideas.
- **Accommodation:** Old ideas are restructured to include, or *accommodate*, new experiences.

assimilation The reinterpretation of new experiences to fit into old ideas.

accommodation The restructuring of old ideas to include new experiences.

Accommodation is more difficult than assimilation, but it advances thought. Children—and everyone else—actively develop new concepts. In Piagetian terms, they *construct* ideas based on their experiences.

Ideally, when two people disagree, or when they surprise each other by what they say, adaptation is mutual. For example, when parents are startled by their children's opinions, the parents may revise their concepts of their children and even of reality, accommodating to new perceptions. If an honest discussion occurs, the children, too, might accommodate. Cognitive growth is an active process; clashing concepts require new thought.

information-processing theory A perspective that compares human thinking processes, by analogy, to computer analysis of data, including sensory input, connections, stored memories, and output.

Information Processing

Piaget is credited with discovering that people's assumptions and perceptions affect their development, an idea now accepted by most social scientists. However, many think Piaget's theories were limited. Neuroscience, cross-cultural studies, and step-by-step understanding of cognition have revealed the limitations of Piaget's theory.

As one admirer explains, Piaget's "claims were too narrow and too broad" (Hopkins, 2011, p. 35). The narrowness comes from his focus on science, ignoring that people can be advanced in their understanding of physics and biology but not in other aspects of thought. The broadness is in his description of stages. Contrary to Piaget's ideas, "intelligence is now viewed more as a modular system than as a unified system of general intelligence" (Hopkins, 2011, p. 35).

Now consider a newer version of cognitive theory, **information-processing theory,** inspired by the input, programming, memory, and output of a sophisti-



FIGURE 2.1

Challenge Me Most of us, most of the time, prefer the comfort of our conventional conclusions. According to Piaget, however, when new ideas disturb our thinking, we have an opportunity to expand our cognition with a broader and deeper understanding. Living in another country, attending college far from home, or even a deep conversation with someone who disagrees with you—all these advance intelligence via disequilibrium.

Table 2.3 Piaget's Periods of Cognitive Development

	Name of Period	Characteristics of the Period	Major Gains During the Period
Birth to 2 years	Sensorimotor	Infants use senses and motor abilities to understand the world. Learning is active, without reflection.	Infants learn that objects still exist when out of sight (*object permanence*) and begin to think through mental actions.
2–6 years	Preoperational	Children think symbolically, with language, yet children are *egocentric*, perceiving from their own perspective.	The imagination flourishes, and language becomes a significant means of self-expression and social influence.
6–11 years	Concrete operational	Children understand and apply logic Thinking is limited by direct experience.	By applying logic, children grasp concepts of conservation, number, classification, and many other scientific ideas.
12 years through adulthood	Formal operational	Adolescents and adults use abstract and hypothetical concepts. They can use analysis, not only emotion.	Ethics, politics, and social and moral issues become fascinating as adolescents and adults use abstract, theoretical reasoning.

cated computer. When conceptualized in that way, thinking is affected by changes in the activity of the brain.

Information processing is "a framework characterizing a large number of research programs" (Miller, 2011, p. 266). Instead of interpreting *responses* by infants and children, as Piaget did, this cognitive theory focuses on the *processes* of thought—that is, how minds work before a response.

Information-processing theorists note that responses can occur in many ways, including through the senses and bodily activity, which in turn affect thinking (Glenberg et al., 2013). The underlying theoretical basis of information processing is that the details of process shed light on the specifics of outcome.

According to this perspective, cognition begins when input is picked up by the five senses. It proceeds to brain reactions, connections, and stored memories, and it concludes with some form of output. For infants, output consists of moving a hand, making a sound, or staring a split second longer at one stimulus than at another. As a person develops, information-processing scientists study not only words but also hesitations, neuronal activity, and bodily reactions (heartbeat, blood pressure, and the like).

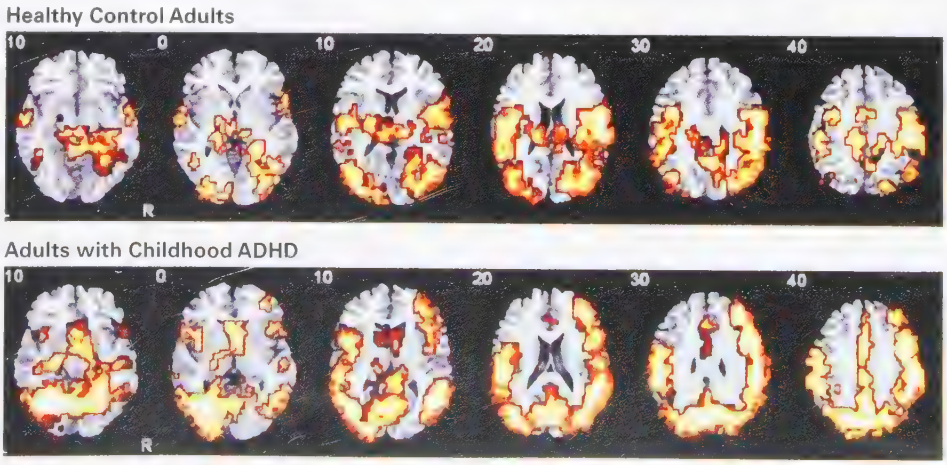
The latest techniques to study the brain have produced insights from neuroscience on the sequence and strength of neuronal communication and have discovered patterns beyond those traced by early information-processing theory. With the aid of sensitive technology, information-processing research has also overturned some of Piaget's findings, as explained in later chapters.

However, the basic tenet of cognitive theory is true for neuroscience, information processing, and for Piaget: Ideas matter. For example, how children interpret a future social situation, such as whether they anticipate welcome or rejection, affects the quality of their actual friendships. Positive information processing correlates with positive friendships.

This approach to understanding cognition has many applications. For instance, it has long been recognized

We Try Harder Details of brain scans require interpretation from neurologists, but even the novice can see that adults who have been diagnosed with ADHD (second line of images) reacted differently in this experiment when they were required to push a button only if certain letters appeared on a screen. Sustained attention to this task required more brain power (the lit areas) for those with ADHD. Notice also that certain parts of the brain were activated by the healthy adults and not by the ADHD ones. Apparently adults who had problems paying attention when they were children have learned to focus when they need to, but they do it in their own way and with more effort.

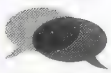
CUBILLO ET AL. (2012). A REVIEW OF FRONTO-STRIATAL AND FRONTO-CORTICAL BRAIN ABNORMALITIES IN CHILDREN AND ADULTS WITH ATTENTION DEFICIT HYPERACTIVITY DISORDER (ADHD) AND NEW EVIDENCE FOR DYSFUNCTION IN ADULTS WITH ADHD DURING MOTIVATION AND ATTENTION. *CORTEX, 48*(2), 194–215. DOI: 10.1016/J.CORTEX.2011.04.007 WITH PERMISSION FROM ELSEVIER



that children with ADHD (attention-deficit/hyperactivity disorder) tend to have difficulty learning in school, obeying their parents, and making friends (whether or not they are excessively active). Information-processing research has led to the discovery that certain brain circuits (called *fronto-striatal systems*) do not function normally in children with ADHD. Consequently, it is hard for them to read facial expressions and interpret voice tones in order to understand others' emotions (Uekermann et al., 2010).

This means that children with ADHD may not know whether their father's "Come here" is an angry command or a loving suggestion. Nor do they immediately know if a classmate is hostile or friendly. Information processing helps in remediation: If a specific brain function can be improved, children may learn more, obey more, and gain friends.

Remember that all theories are designed to be useful. The Opposing Perspectives feature is one illustration of the way psychoanalytic, behaviorist, and cognitive theory might apply to common parental concerns—how and when to respond to a baby's cry, and how and when to toilet train their child.



opposing perspectives

Toilet Training—How and When?

Parents hear opposite advice about when to respond to an infant's cry. Some experts tell them that ignoring the cry will reduce the infant's future happiness (psychoanalytic theory—advocating attachment parenting), while others tell them that responding to every cry will teach the child to be demanding and spoiled (behaviorist theory—advocating strong character). Neither theory directly predicts dire results, but each underlies one side or the other of this debate.

Meanwhile, cognitive theory seeks to understand the reason for the cry. Is it a reflexive wail of hurt and hunger, or is it an expression of social pain? According to this theory, when people understand what a particular action means to the actor, then effective response is possible. Thus all three theories have led to advice for parents—although the advice is conflicting.

Another practical example is toilet training. In the nineteenth century, many parents believed that bodily functions should be controlled as soon as possible in order to distinguish humans from lower animals. Consequently, they began toilet training in the first months of life (Accardo, 2006). Then psychoanalytic theory pegged the first year as the oral stage (Freud) or the time when trust was crucial (Erikson), before the toddler's anal stage (Freud) began or autonomy needs (Erikson) emerged.

Consequently, psychoanalytic theory led to postponing toilet training to avoid serious personality problems later on. Soon this was part of many manuals on child rearing. For example, a leading pediatrician, Barry Brazelton, wrote a popular book for parents advising that toilet training should not begin until the child is cognitively, emotionally, and biologically ready—around age 2 for daytime training and age 3 for nighttime dryness.



ANDREA MOHIN/THE NEW YORK TIMES/REDUX PICTURES

What to Do? Books on infant care give contradictory advice. Even in this photo one can see that these modern mothers follow divergent parenting practices. One is breast-feeding a one-year-old, another has toilet-trained her toddler, one sits cross-legged so her baby can be on her lap, which would be impossible for another—and so on.

SUMMING UP Cognitive theory holds that to understand a person, one must learn how that person thinks. According to Piaget, cognition develops in four distinct, age-related stages: sensorimotor, preoperational, concrete operational, and formal operational. According to information-processing theory, the human mind is similar to a sophisticated computer: a multiplicity of components are processed by particular programs within the brain, eventually resulting in learning new skills, perceptions, and actions.

WHAT HAVE YOU LEARNED?

1. What is the basic idea of cognitive theory?
2. How do the processes of assimilation and accommodation lead to more advanced thinking?
3. In what ways are assimilation and accommodation similar?
4. How does information processing connect to neuroscience, the study of the brain?
5. What do all the cognitive theories have in common?

> As a society, we are far too concerned about pushing children to be toilet trained early. I don't even like the phrase "toilet training." It really should be toilet learning.
>
> *[Brazelton & Sparrow, 2006, p. 193]*

By the middle of the twentieth century, many U.S. psychologists had rejected psychoanalytic theory and become behaviorists. Since they believed that learning depends primarily on conditioning, some suggested that toilet training occur whenever the parent wished, not at a particular age. In one application of behaviorism, children drank quantities of their favorite juice, sat on the potty with a parent nearby to keep them entertained, and then, when the inevitable occurred, the parent praised and rewarded them—a powerful reinforcement. Children were conditioned (in one day, according to some behaviorists) to head for the potty whenever the need arose (Azrin & Foxx, 1974).

Rejecting both of these theories, some Western parents prefer to start potty training very early. One U.S. mother began training her baby just 33 days after birth. She noticed when her son was about to defecate, held him above the toilet, and had trained him by 6 months (Sun & Rugolotto, 2004). Such early training is criticized by all of the grand theories, although each theory has a particular critique, as now explained.

Psychoanalysts would wonder what made her such an anal person, with a need for cleanliness and order that did not consider the child's needs. Behaviorists would say that the mother was trained, not the son. She taught herself to be sensitive to his body; she was reinforced when she read his clues correctly. Cognitive theory would wonder what the mother was thinking. For instance, did she have an odd fear of normal body functions?

What is best? Dueling theories and diverse parental practices have led the authors of an article for pediatricians to conclude that "despite families and physicians having addressed this issue for generations, there still is no consensus regarding the best method or even a standard definition of toilet training" (Howell et al., 2010, p. 262). One comparison study of toilet-training methods found that the behaviorist approach was best for older children with serious disabilities but that almost every method succeeded with the average young child. No method seemed to result in marked negative emotional consequences (Klassen et al., 2006). Many sources explain that because each child is different, there is no "right" way, "the best strategy for implementing training is still unknown" (Colaco et al., 2013, p. 49).

That conclusion arises from cognitive theory, which holds that each person's assumptions and ideas determine their actions. Therefore, since North American parents are from many cultures with diverse assumptions, marked variation is evident in beliefs regarding toilet training.

Contemporary child-rearing advice also considers the child's own cognitive development. If the child is at the sensorimotor stage, then body sensations and reflexive actions are central to training. Later on, when language has been added to the mix, the child's intellectual awareness (as evidenced by wanting "big boy" underpants and so on) is crucial.

What values are embedded in each practice? Psychoanalytic theory focuses on later personality, behaviorism stresses conditioning of body impulses, and cognitive theory considers variation in the child's intellectual capacity and in adult values. Even the idea that each child is different, making no one method best, is the outgrowth of a theory. There is no easy answer, but many parents are firm believers in one approach or another. That confirms the statement at the beginning of this chapter: We all have theories, sometimes strongly held, whether we know it or not.



Affection for Children Vygotsky lived in Russia from 1896 to 1934, when war, starvation, and revolution led to the deaths of millions. Throughout this turmoil, Vygotsky focused on learning. His love of children is suggested by this portrait: He and his daughter have their arms around each other.

Sociocultural Theory: Vygotsky and Beyond

New theories have emerged that are multicultural and multidisciplinary, unlike the first three theories. These theories are "new" in that their applications to human development are relatively recent, although their roots are ancient.

The central thesis of **sociocultural theory** is that human development results from the dynamic interaction between developing persons and their surrounding society. Culture is viewed not as something external that impinges on developing persons but as integral to their development every day via the social context (all the dynamic systems described in Chapter 1).

sociocultural theory A newer theory that holds that development results from the dynamic interaction of each person with the surrounding social and cultural forces.

Social Interaction

The pioneer of the sociocultural perspective was Lev Vygotsky (1896–1934), a psychologist from the former Soviet Union. In the United States, Urie Bronfrenbrenner (1917-2005), an American also born in the Soviet Union, was an early advocate of this approach: His ecological approach emphasizes the social context of development. (The basics of the ecological approach are accepted by virtually all contemporary developmentalists, and therefore were described in Chapter 1.)

Vygotsky noted that each community in his native land (comprising Asians and Europeans of many faiths and many languages) taught children whatever beliefs and habits they valued. For example, his research included how farmers used tools, how illiterate people thought of abstract ideas, and how children learned in school.

In his view, each person, schooled or not, develops with the guidance of more skilled members of his or her society, who are tutors or mentors in an **apprenticeship in thinking** (Vygotsky, 2012). Just as, in earlier centuries, a young person might become an apprentice to an experienced artisan, learning the trade, Vygotsky believed that adults teach children how to think by explaining ideas, asking questions, and repeating values.

apprenticeship in thinking Vygotsky's term for how cognition is stimulated and developed in people by more skilled members of their community.

To describe this process, Vygotsky developed the concept of **guided participation,** the method used by parents, teachers, and entire societies to teach novices the skills and habits expected within their culture. Tutors engage learners (also called *apprentices*) in joint activities, offering instruction and "mutual involvement in several widespread cultural practices with great importance for learning: narratives, routines, and play" (Rogoff, 2003, p. 285). Active apprenticeship and sensitive guidance are central to sociocultural theory because each person depends on others to learn. This process is informal, pervasive, and social.

guided participation The process by which people learn from others who guide their experiences and explorations. This learning is direct and interactive.

All cultural patterns and beliefs are social constructions, not natural laws, according to sociocultural theorists. These theorists find customs to be powerful, shaping the development of every person, and they contend that some assumptions need to shift to allow healthier development. Vygotsky stressed this point, arguing that disabled children should be educated (Vygotsky, 1994b). This is a cultural belief that has become law in the United States but is not yet accepted in many other nations.

The Zone of Proximal Development

According to sociocultural theory, all learning is social, whether people are learning a manual skill, a social custom, or a language. As part of the apprenticeship of thinking, a mentor (parent, peer, or professional) finds the learner's **zone of proximal development,** an imaginary area surrounding the child, which contains the skills, knowledge, and concepts that the learner is close (proximal) to acquiring but cannot yet master without help.

zone of proximal development In sociocultural theory, a metaphorical area, or "zone," surrounding a learner that includes all the skills, knowledge, and concepts that the person is close ("proximal") to acquiring but cannot yet master without help.

Through sensitive assessment of each learner, mentors engage mentees within that zone. Together, in a "process of joint construction," new knowledge is attained (Valsiner, 2006). The mentor must avoid two opposite dangers: boredom and failure. Some frustration is permitted, but the learner must be actively engaged, never passive or overwhelmed (see Figure 2.2).

To make this seemingly abstract process more concrete, consider an example: a father teaching his daughter to ride a bicycle. He begins by rolling her along, supporting her weight while telling her to keep her hands on the handlebars, to push the right and left pedals in rhythm, and to look straight ahead. As she becomes more comfortable and confident, he begins to roll her along more quickly, praising her for steadily pumping. Within a few lessons, he is jogging beside her, holding only the handlebars.

When the father senses that his daughter can balance, he urges her to pedal faster while he loosens his grip. Without realizing it, she rides on her own.

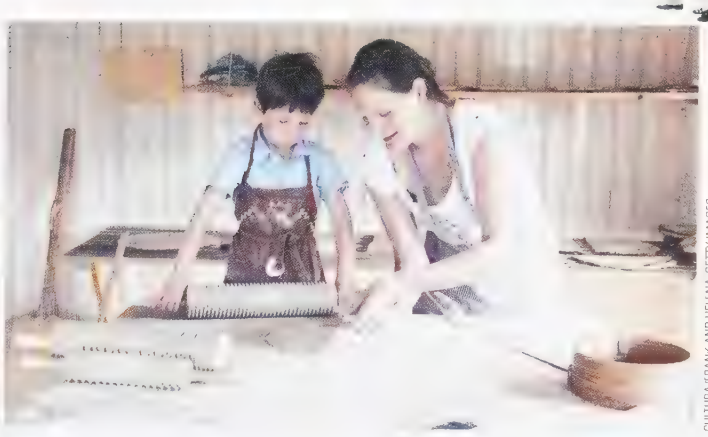
Note that this is not instruction by preset rules or reinforcement. Sociocultural learning is active: No one learns to ride a bike by reading and memorizing written instructions, and no good teacher merely repeats a prepared lesson. Also note that the father is not the only teacher here. The culture also teaches, via the child having seen other people on bikes, and via special bikes for young children. All such bikes are smaller, of course, but some have no pedals and some have training wheels, both of which are cultural artifacts that can help guide participation in bike riding.

Because each learner has personal traits and experiences, education must be individualized. Learning styles vary: Some people need more assurance; some learn best by looking, others by hearing.

A mentor must sense when support or freedom is needed and how peers can help (they may be the best mentors). Skilled teachers know when the zone of proximal development expands and shifts.

Excursions into and through the zone of proximal development are everywhere. At the thousand or so science museums in the United States, children ask numerous questions, and adults guide their scientific knowledge (Haden, 2010). Physical therapists tailor exercises to the particular patient and the surrounding context. For example, when physical therapists provide exercise for patients in intensive care, they not only take into account the illness but also the culture of the ICU (Pawlik & Kress, 2013).

In another example that occurs for every Western child, learning to sit at the table and eat with a knife and fork is a long process, with many steps of guided participation. Parents do not "spoon-feed" their 3-year-olds



CULTURA/FRANK AND HELENA/GETTY IMAGES

Home-Schooling Academic achievement tests in reading and math class may crowd out practical skills, such as how to apply proper pressure with a rolling pin. This boy is fortunate that his mother guides him in mastering the domestic arts. He also is learning other skills in regular school.



FIGURE 2.2

The Magic Middle Somewhere between the boring and the impossible is the zone of proximal development, where interaction between teacher and learner results in knowledge never before grasped or skills not already mastered. The intellectual excitement of that zone is the origin of the joy that both instruction and study can bring.

or expect them to cut their own meat. Instead they find the proper zone of proximal development, and provide appropriate tools and experiences.

In general, mentors, attuned to ever-shifting abilities and motivation, continually urge a new competence—the next level, not the moon. For their part, learners ask questions, show interest, and demonstrate progress, which guides and inspires the mentors. When education goes well, both are fully engaged and productive within the zone of proximal development. Particular skills and processes vary enormously, but the overall interaction is the same.

Taking Culture into Account

The sociocultural perspective has led contemporary scientists to consider social context in every study. Earlier theorists and researchers are criticized for failing to do so. This newer approach considers not only differences between one nation and another, but also differences between one region and another, between one cohort and another, between one ethnic group and another, and so on.

This approach has led to a wealth of provocative findings, many of which are described later. A sociocultural perspective has been particularly helpful in early childhood education (Woodrow, 2014), as children have diverse cultural experiences by the time they enter preschool.

Culture is not a monolith, with every child in a particular community, or even a particular family, experiencing the same influences. Instead, culture needs to be considered person by person: Each individual participates in some aspects of the community culture while rejecting or modifying others.

Consider two sisters:

> When the local constables knocked on Chona's parents' door with their wooden staffs, searching for children to send to the school, her parents hid their children under the wooden bed just inside the door and told the constables that the children did not exist. But Chona's sister Susana, ever rebellious, leaped out from under the bed and yelled . . . "I want to go to school."
>
> *(Rogoff, 2011, p. 5)*

Especially for Adoptive Families Does the importance of attachment mean that adopted children will not bond securely with nonbiological caregivers? (see response, page 56)

These two sisters, both speaking a local language, raised in the same tribal culture (Mayan, in San Pedro, Guatemala), nevertheless followed distinct cultural paths. Later Susana refused an arranged marriage and moved to a nearby town, unlike her unschooled sister who married a man she did not like and stayed close to her childhood home all her life. Culture shapes everyone, but each person experiences it differently.

SUMMING UP Sociocultural theory is more multicultural than the theories described earlier in this chapter. The pioneer of sociocultural theory was Lev Vygotsky, who said that each learner is an apprentice, guided by a more skilled or knowledgeable person. Learning occurs within a zone a proximal development, that region that the learner is almost able to learn—neither too advanced nor too simple—via sensitive collaboration between a teacher (who could be a parent or a peer) and a learner who is ready to master the next step. Cultural differences are crucial in both what is learned and how it is learned.

WHAT HAVE YOU LEARNED?

1. How is "apprenticeship in thinking" an example of sociocultural theory?
2. How does the teacher encourage learning in the zone of proximal development?
3. What is an example of a cultural difference in the expectations a child might have about school?

The Universal Perspective: Humanism and Evolution

No developmentalist doubts that each person is unique, yet many social scientists contend that the sociocultural focus on differences (cultural, ethnic, sexual, economic) depicts a fractured understanding of development.

Moreover, no developmentalist doubts that nonhuman animals can help us understand humans. However, many think that the psychoanalytic emphasis on sexual needs, and the behaviorist stress on laws of behavior, ignore aspects of development that characterize all humans but not all animals.

Universal theories hold that people share impulses and motivations, which they express in ways most other animals cannot. A universal perspective has been articulated in many developmental theories, each expressed in particular ways but always contending that humans have much in common with each other.

Here we describe two of the most prominent of such perspectives: humanism and evolutionary theory. These two may seem to be opposite, in that humanism emphasizes the heights of human striving and evolutionary theory begins with consideration of quite simple instincts, but several recent scholars have found many similarities in these theories, contending that the "hierarchy of human motives" (humanism) can be anchored "firmly in the bedrock of modern evolutionary theory" (Kenrick et al., 2010, p. 292).

Humanism

Many scientists are convinced that there is something hopeful, unifying, and noble in the human spirit, something ignored by psychoanalytic theory (which envisions self-centered, childhood sexuality) and by behaviorism (which seems to ignore free will). The limits of those two theories were apparent to two Americans: Abraham Maslow (1908–1970) and Carl Rogers (1902–1987), both deeply religious men.



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Hope and Laughter
Maslow studied law before psychology, and he enjoyed deep discussions with many psychoanalytic theorists who escaped Nazi-dominated Europe. He believed the human spirit could overcome oppression and reach self-actualization, where faith, hope, and humor abound.

Maslow and Rogers had witnessed the Great Depression and two world wars and concluded that traditional psychological theories underrated human potential by focusing on evil, not good. They founded a theory called **humanism** that became prominent after World War II, as millions read Maslow's *Toward a Psychology of Being* (1999) and Rogers's *On Becoming a Person* (2004).

humanism A theory that stresses the potential of all humans for good and the belief that all people have the same basic needs, regardless of culture, gender, or background.

Maslow believed that all people—no matter what their culture, gender, or history—have the same basic needs. He arranged these needs in a hierarchy, often illustrated as a pyramid (see Figure 2.3):

1. Physiological: needing food, water, warmth, and air
2. Safety: feeling protected from injury and death
3. Love and belonging: having friends, family, and a community (often religious)
4. Esteem: being respected by the wider community as well as by oneself
5. Self-actualization: becoming truly oneself, fulfilling one's unique potential while appreciating all of humanity

Response for Adoptive Families (from page 54) Not at all. Attachment is the result of responsiveness, not biology. In some cultures, many children are adopted from infancy, and the emotional ties to their caregivers are no less strong than for other children.

This pyramid caught on almost immediately; it was one of the most "contagious ideas of behavioral science" because it seemed insightful about human psychology (Kenrick et al., 2010, p. 292). This theory is not a developmental theory in the traditional sense, in that Maslow did not believe that the levels were connected to a particular stage or age. However, his levels are sequential: Lower levels need to be satisfied before the higher levels.

Thus meeting a child's needs for basic care, for safety, and for friendship was a prerequisite for self-esteem and self-actualization. At the highest level, when basic needs have been met, people can be fully themselves—creative, spiritual, curious, appreciative of nature, able to respect everyone else.

Rogers also stressed the need to accept and respect one's own personhood as well as that of everyone else. He thought that people should give each other *unconditional positive regard*, which means that they should see (regard) each other with appreciation (positive) without conditions (unconditional). This is what parents often do for their children: they love and cherish them even when the child cries, disobeys, or encounters trouble.

If parents do not have unconditional positive regard for their children, the danger is that the children will have long-lasting problems with intimacy and self-acceptance (Roth & Assor, 2012). Rogers spent the last years of his life trying to reconcile opposing factions in Northern Ireland, South Africa, and Russia; he believed all sides need to listen to each other.

As you can see, humanists emphasize what all people have in common, not their national, ethnic, or cultural divisions. Maslow contended that everyone, universally, must satisfy each lower level of the hierarchy of needs before moving higher. A starving man, for instance, may not be concerned for his own safety when he seeks food (level 1 precedes level 2), or an unloved woman might not care about self-respect because she needs love (level 3 precedes level 4).

Maslow thus was more accepting of people who others see as hostile to their nation, or religion, or group. Destructive and inhumane actions may be the conse-



Source: Maslow, 1997

FIGURE 2.3
Moving Up, Not Looking Back Maslow's hierarchy is like a ladder: Once a person stands firmly on a higher rung, the lower rungs are no longer needed. Thus, someone who has arrived at step 4 might devalue safety (step 2) and risk personal safety to gain respect.

quence of unmet lower needs, which may be met later if a child was neglected or abused. Recovery is possible.

Notice the relevance for child development. Babies seek food and comfort, children seek approval, and not until adulthood can a person focus wholeheartedly on success and esteem, beyond the immediate approval of friends and family. Satisfaction of early needs is crucial for later self-acceptance, according to Maslow. People may become thieves or even killers, unable to reach their potential, to self-actualize, if they were unsafe or unloved as children.

Rogers agreed that adults who were deprived of unconditional positive regard in childhood might become selfish and antisocial. He developed a method of psychological therapy widely used to help people become more accepting of themselves and therefore of other people, overcoming early deprivation.

Humanism is still prominent among medical professionals because they recognize that pain is not always physical (the first two levels) but can also be social (the next two) (Majercsik, 2005; Zalenski & Raspa, 2006). Even the very sick need love and belonging (friends and family) and esteem (the dying need respect).

Especially for Nurses Maslow's hierarchy is often taught in health sciences because it alerts medical staff to the needs of patients. What specific hospital procedures might help? (see response, page 59)

Evolutionary Theory

You are familiar with Charles Darwin and his ideas, first published 150 years ago: Essentially he showed that plants, insects, birds, and animals developed over billions of years, as life evolved from primitive cells to humans (Darwin, 1859).

But you may not realize that serious research on human development inspired by this theory does not focus on lower creatures, but instead studies the history of human characteristics. Evolutionary psychology is quite recent (Simpson & Kenrick, 2013). As two leaders in this field write:

> During the last two decades, the study of the evolutionary foundations of human nature has grown at an exponential rate. In fact, it is now a booming interdisciplinary scientific enterprise, one that sits at the cutting edge of the social and behavioral sciences.
>
> *[Gangestad & Simpson, 2007, p. 2]*

Why Adults Protect Their Children

Evolutionary theory has intriguing explanations for many issues in human development, including a pregnant woman's nausea, 1-year-olds' attachment to their parents, and obesity in childhood and beyond. According to this theory, many impulses, needs, and behaviors evolved to help children survive and thrive many millennia ago (Konner, 2010).

To understand human development, this theory contends that humans should understand the lives of our early ancestors. For example, many people are terrified of snakes; they scream and break into a cold sweat upon seeing one. However, virtually no one is terrified of automobiles. Yet for current deaths in the United States, the ratio of snake to car deaths is 1 to 10,000. In 2014, only two people died from snake bites: a Kentucky man in a snake-handling religious service, and a Missouri man who picked up a copperhead to show his son (Otto, 2014). The extreme reaction to snakes derives from instinctive fears that evolved over millennia, when snakes were common killers. Thus,

> evolutionarily, ancient dangers such as snakes, spiders, heights, and strangers appear on lists of common phobias far more often than do evolutionarily modern dangers such as cars and guns, even though cars and guns are more dangerous to survival in the modern environment.
>
> *[Confer et al., 2010, p. 111]*

Since our fears have not caught up to modern inventions, we use our minds to pass laws regarding infant seats, child safety restraints, seat belts, red lights, and

Especially for Teachers and Counselors of Teenagers Teen pregnancy is destructive of adolescent education, family life, and sometimes even health. According to evolutionary theory, what can be done about this? (see response, page 60)

speed limits. Humanity is succeeding in such measures: The U.S. motor-vehicle death rate has been cut in half over the past 20 years.

Other modern killers—climate change, drug addiction, obesity, pollution—also require social management because instincts are contrary to what we now know about the dangers of each of these. Evolutionary theory contends that recognizing the ancient origins of destructive urges—such as the deadly desire to eat calorie-dense chocolate cake—is the first step in controlling them (King, 2013).

According to evolutionary theory, every species has two long-standing, biologically based drives: survival and reproduction. Understanding these two drives provides insight into protective parenthood, the death of newborns, infant dependency, child immaturity, the onset of puberty, and much more (Konner, 2010).

Later chapters will explain these, but here is one example. Adults consider babies cute—despite the reality that babies have little hair, no chins, stubby legs, and round stomachs—all of which are considered unattractive in adults. The reason, evolutionary theory contends, is that adults are instinctually attuned to protect and cherish the young of the species.

A competing instinct is to perpetuate one's progeny, even at the expense of other people's children. That might lead to infanticide, again explained by evolutionary theory. Chimpanzee males who take over a troop kill babies of the deposed male; humans, of course, have created laws against such practices (Hrdy, 2009).

Genetic Links

selective adaptation The process by which living creatures (including people) adjust to their environment. Genes that enhance survival and reproductive ability are selected, over the generations, to become more prevalent.

A basic idea from evolutionary theory—**selective adaptation**—proposes that humans today react in ways that helped promote survival and reproduction long ago. According to one version of selective adaptation, genes for traits that aid survival and reproduction are selected over time to allow the species to thrive (see Figure 2.4).

Some of the best qualities of people—cooperation, spirituality, and self-sacrifice—may have originated thousands of years ago when people survived because they took care of one another. Childhood itself, particularly the long period when children depend on their parents, can be explained via evolution (Konner, 2010).

The process of selective adaptation works as follows: If one person happens to have a trait that makes survival more likely, the gene (or combination of genes) responsible for that trait is likely to be passed on to the next generation because that person is likely to survive long enough to reproduce. Anyone who inherits a beneficial gene (or combination of genes) has an increased chance of growing up, finding a mate, and bearing children—some of whom would inherit that gene (or genes) and the resultant desirable trait.

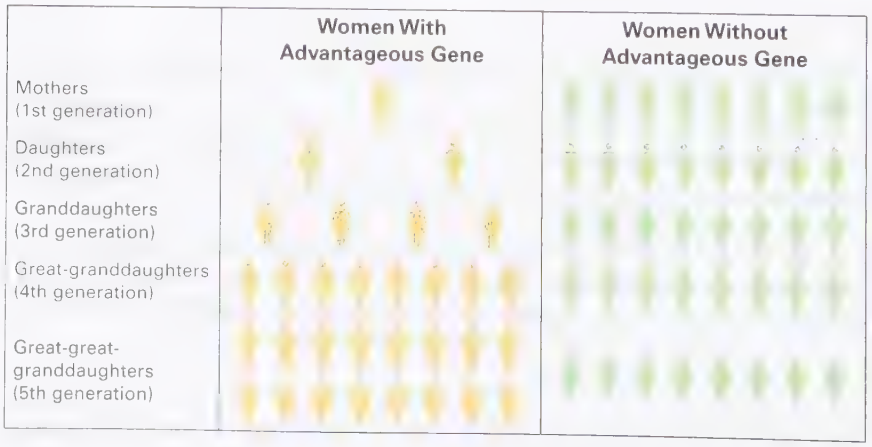


FIGURE 2.4

Selective Adaptation Illustrated Suppose only one of nine mothers happened to have a gene that improved survival. The average woman had only one surviving daughter but this gene mutation might mean more births and more surviving children, such that each woman who had the gene bore two girls who survived to womanhood instead of one. As you see, in 100 years, the "odd" gene becomes more common, making it a new normal.



Got Milk! Many people in Sweden (like this barefoot preschooler at her summer cottage) drink cow's milk and eat many kinds of cheese. That may be because selective adaptation allowed individuals who could digest lactose to survive in the long Northern winters when no crops grew.

For example, originally almost all human babies could digest lactose in their mother's milk but probably became *lactose intolerant* as they grew older, and therefore unable to digest too much cow's milk (Suchy et al., 2010). In a few regions thousands of years ago cattle were domesticated and raised for their meat. In those places, "killing the fatted calf" provided a rare feast for the entire community when a major celebration occurred.

In cattle-raising regions, if a young woman chanced to have an aberrant gene for the enzyme that allows digestion of cow's milk and drank milk intended for a calf, she was likely to avoid malnutrition, experience early puberty, sustain many pregnancies, and breast-feed her thriving babies. For all those reasons, she would raise many children. In that way, the next generation would include more people who inherited that gene. Interestingly, there are several distinct versions of lactose tolerance: Apparently different odd genes appeared in several cattle-raising regions, and in each area selective adaptation increased the prevalence of the gene (Mattar et al., 2012).

This process of selective adaptation continues over many generations. The fact that the odd gene for lactose tolerance became more common, providing survival in cattle-raising communities, explains why few Scandinavians are lactose-intolerant but many Africans are—a useful fact for Wisconsin dairy farmers who want to ship milk to starving children in Senegal.

Once it was understood that milk might make some children sick, better ways to relieve hunger were found. Although malnutrition is still a global problem, about a third fewer children are malnourished than was the case in 1990 (UNICEF, 2012). One reason is that nutritionists now know which foods are digestible, nourishing, and tasty for whom. Evolutionary psychology has helped with that.

For groups as well as individuals, evolutionary theory notices how the interaction of genes and environment affects survival and reproduction. Genetic variations are particularly beneficial when the environment changes, which is one reason genetic diversity benefits humanity as a whole.

If a species' gene pool does not include variants that allow survival in difficult circumstances (such as exposure to a new disease or to an environmental toxin), the entire species becomes extinct. One recent example is HIV/AIDS, deadly in most untreated people but not in a few who are genetically spared. No wonder biologists worry when a particular species becomes inbred—diversity is protective.

Evolution and Culture

Genetic variation among humans, differential sensitivity, and plasticity (explained in Chapter 1) enable humans to survive and multiply. This variation applies not only to biological traits (such as digestion of milk) but also to psychological traits that originate in the brain and then are shaped by culture (Confer et al., 2010; Tomasello, 2009).

Evolutionary theory contends that certain epigenetic factors foster socialization, parenthood, communication, and language, all of which helped humans a hundred thousand years ago and allowed societies a few thousand years ago to develop writing, then books, and then universities. As a result, humans learn from history

✓ **Response for Nurses** (from page 57) Reassurance from nurses (explaining procedures, including specifics and reasons) helps with the first two, and visitors, cards, and calls might help with the next two Obviously, specifics depend on the patient, but everyone needs respect as well as physical care.

Response for Teachers and Counselors of Teenagers (from page 58) Evolutionary theory stresses the basic human drive for reproduction, which gives teenagers a powerful sex drive. Thus, merely informing teenagers of the difficulty of caring for a newborn (some high school sex-education programs simply give teenagers a chicken egg to nurture) is not likely to work. A better method would be to structure teenagers' lives so that pregnancy is impossible—for instance, with careful supervision or readily available contraception.

and from strangers in distant continents. The fact that you are reading this book, accepting some ideas and rejecting others, is part of the human heritage that will aid future generations, according to evolutionary theory.

In recent years, "evolutionary psychology has grown from being viewed as a fringe theoretical perspective to occupying a central place within psychological science" (Confer et al., 2010). This theory is insightful and intriguing, but some interpretations are hotly disputed.

For instance, an evolutionary account of mental disorders suggests that some symptoms (such as an overactive imagination or crushing anxiety) are normal extremes of adaptive traits, and that few people should be considered mentally ill. In this view, depression particularly can be seen to have been adaptive in ancient times, and now is seen as a mood that needs to be treated with respect and by making changes in life circumstances rather than treating it with drugs (Rothenberg, 2014).

This perspective is rejected by many psychologists and by neuroscientists who consider many forms of mental illness to be caused by an imbalance of neurotransmitters or a deficit in some particular parts of the brain. Also controversial are explanations of sex differences, as the following explains.

a view from science

If Your Mate Were Unfaithful

Men seek more sexual partners than women do. Brides are younger, on average, than grooms. These are norms, not followed in every case, but apparent in every culture. Why?

An evolutionary explanation begins with biology. Since females, not males, become pregnant and breast-feed, in most of human history mothers needed mature, strong men to keep predators away. That helped women fulfill their evolutionary destiny, to bear children who would live long enough to reproduce. Consequently, women chose men who were big and strong, and then kept them nearby with home cooking and sex.

A man was more able to father many children if he removed his rivals and had multiple sexual partners—all young, curvaceous, and healthy—who would birth many surviving babies with that man's genes. This theory explains why powerful kings had many young wives and concubines. Those ancient needs may have led to male/female hormonal differences, so that even today many men are attracted to younger women, while many women seek one steady marriage partner.

The evolutionary reasons for men to become faithful partners to one woman despite their impulse included the fact that men needed to keep other men away in order to protect their children (Lukas & Clutton-Brock, 2013). Men tried to show women that they were powerful mates, displaying impulses that now fuel gang wars and dangerous driving. For their part, women tried to show men that they were sexually exciting. In other words, useful evolutionary traits may have gone awry in today's circumstances, fueling risk-taking in adolescents that is destructive (Ellis et al., 2012).

Does this interpretation have empirical research support? Evolutionary scientists have asked people of many ages, nationalities, and religions to imagine their romantic partner either "forming a deep emotional attachment" or "enjoying passionate sexual intercourse" with another man or woman. Then the participants are asked which of those two possibilities is more distressing. The men generally are more upset at sexual infidelity while the women are more upset with emotional infidelity (Buss et al., 2001).

For example, one study involved 212 college students, all U.S. citizens, whose parents were born in Mexico (Cramer et al., 2009). As with other populations, more women (60 percent) were distressed at the emotional infidelity and more men (66 percent) at the sexual infidelity.

A meta-analysis of 47 independent samples—sometimes reported by skeptics who doubted evolution—confirms that men are more sexually jealous than women are (Sagarin et al., 2012). Of course, this does not prove the evolutionary explanation, but that particular sex difference does seem universal.

Evolutionary theory explains this oft-replicated result by noting that for centuries a woman has needed a soul mate to be emotionally committed, to ensure that he will provide for her and her children, whereas a man has needed a woman to be sexually faithful to ensure that her children are also his. (She knows her children are hers, because she birthed them; he is sure only if he is positive she never had another lover.)

Many women reject the evolutionary explanation for sex differences. They contend that hypothetical scenarios do not reflect actual experience and that patriarchy and sexism, not genes, produce mating attitudes and patterns (Vandermassen, 2005; Varga et al., 2011).

Similar controversies arise with other applications of evolutionary theory. People do not always act as evolutionary theory predicts: Parents sometimes abandon their newborns, adults sometimes handle snakes, and so on. In the survey of Mexican American college students that was cited in A View from Science, more than one-third did not follow the typical pattern for their gender (Cramer et al., 2009).

Nonetheless, evolutionary theorists contend that humans need to understand the universal, biological impulses within our species in order to control destructive reactions (e.g., we need to make "crimes of passion" illegal) and to promote constructive ones (to protect against newer dangers by manufacturing safer cars and guns).

SUMMING UP Universal theories include humanism and evolutionary theory, both of which stress that all people have the same underlying needs. Humanism holds that everyone merits respect and positive regard in order to become self-actualized. Evolutionary theory contends that thousands of years of selective adaptation have led humans to experience emotions and impulses that have satisfied two universal needs of every species: to survive and to reproduce.

WHAT HAVE YOU LEARNED?

1. Why is humanism considered a hopeful theory?
2. How does Maslow's hierarchy of needs differ from Erikson's stages?
3. How does evolutionary psychology explain human instincts?
4. What is the evolutionary explanation of why parents protect their children?
5. What does the idea of selective adaptation imply about genetics?
6. Why do many women disagree with the evolutionary explanation of sex differences?

What Theories Contribute

Each major theory discussed in this chapter has contributed to our understanding of human development (see Table 2.4):

- *Psychoanalytic theories* make us aware of the impact of early-childhood experiences, remembered or not, on subsequent development.
- *Behaviorism* shows the effect that immediate responses, associations, and examples have on learning, moment by moment and over time.
- *Cognitive theories* bring an understanding of intellectual processes, including the fact that thoughts and beliefs affect every aspect of our development.
- *Sociocultural theories* remind us that development is embedded in a rich and multifaceted cultural context, evident in every social interaction.
- *Universal theories* stress that human differences are less significant than characteristics that are shared by all humans, in every place and era.

No comprehensive view of development can ignore any of these theories, yet each has encountered severe criticism. Psychoanalytic theory has been faulted for being too subjective; behaviorism, for being too mechanistic; cognitive theory, for undervaluing emotions; sociocultural theory, for neglecting individuals; and universal theories, for slighting cultural, gender, and economic variations. Most developmentalists prefer an **eclectic perspective,** choosing what they consider

eclectic perspective The approach taken by most developmentalists, in which they apply aspects of each of the various theories of development rather than adhering exclusively to one theory.

TABLE 2.1 Five Perspectives on Human Development

Theory	Area of Focus	Fundamental Depiction of What People Do	Relative Emphasis on Nature or Nurture?
Psychoanalytic theory	Psychosexual (Freud) or psychosocial (Erikson) stages	Battle unconscious impulses and overcome major crises.	More nature (biological, sexual impulses, and parent–child bonds)
Behaviorism	Conditioning through stimulus and response	Respond to stimuli, reinforcement, and models.	More nurture (direct environment produces various behaviors)
Cognitive theory	Thinking, remembering, analyzing	Seek to understand experiences while forming concepts.	More nature (mental activity and motivation are key)
Sociocultural theory	Social context, expressed through people, language, customs	Learn the tools, skills, and values of society through apprenticeships.	More nurture (interaction of mentor and learner, within contexts)
Universal perspective	Needs and impulses that all humans share as a species	Develop impulses, interests, and patterns to survive and reproduce.	More nature (needs and impulses apply to all humans)

the best aspects of each theory. Rather than adopt any one of these theories exclusively, they make selective use of all of them.

Obviously, all theories reflect the personal background of the theorist (Demorest, 2004), as do all criticisms of theories. Being eclectic, not tied to any one theory, is beneficial because everyone, scientist as well as layperson, tends to be biased. It is easy to dismiss alternative points of view, but using all five theories opens our eyes and minds to aspects of development that we might otherwise ignore. As one overview of seven developmental theories (including those explained here) concludes, "Because no one theory satisfactorily explains development, it is critical that developmentalists be able to draw on the content, methods, and theoretical concepts of many theories" (Miller, 2011, p. 437).

As you will see in many later chapters, theories provide a fresh look at behavior. Imagine a parent and a teacher discussing a child's actions. Each suggests a possible explanation that makes the other say, "I never thought of that." If they listen to each other with an open mind, together they understand the child better.

Having five theories is like having five perceptive observers. All five are not always on target, but it is better to use theory to expand perception than to stay in one narrow groove. A hand functions best with five fingers, although each finger is different and some fingers are more useful than others.

SUMMING UP Theories are needed to suggest hypotheses, to spur investigation, and, finally, to collect data and form conclusions so that empirical evidence can replace untested assumptions. All five of the major theories have met with valid criticism, but each has also advanced our understanding. Most developmentalists are eclectic, making selective use of all these theories and others. This helps guard against bias and keeps scientists, parents, students, and everyone else open to alternative explanations for the complexity of human life.

WHAT HAVE YOU LEARNED?

1 What is the key criticism and key contribution of psychoanalytic theory?
2 What is the key criticism and key contribution of behaviorism?
3 What is the key criticism and key contribution of cognitive theory?
4 What is the key criticism and key contribution of sociocultural theory?
5 What is the key criticism and key contribution of universal theories?
6 What are the advantages and disadvantages of an eclectic perspective?

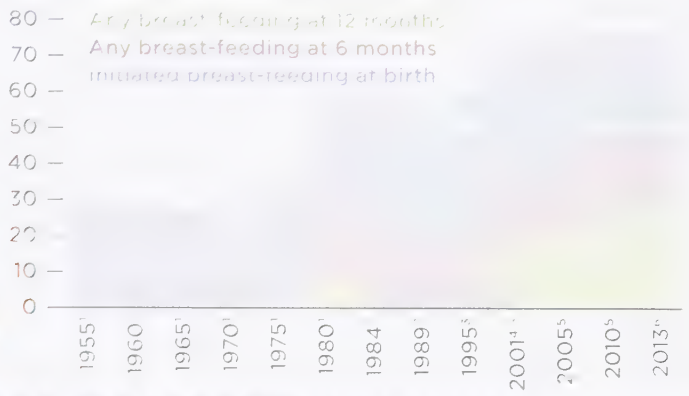
VISUALIZING DEVELOPMENT

Breast-feeding Diversity

Breast-feeding is an interesting example of cultural variations in child development practices around the world. In some parts of the world, and in some cohorts in each country, mothers breast-feed for years. In other places and in other cultural groups, mothers see formula-feeding as safer and more modern. Rates of breast-feeding seem to vary by cohort and culture. Virtually every scientist and pediatrician is convinced that the benefits of breast milk outweigh any dangers, with numerous advantages evident years after infancy. However, the experiences of each cohort differ from earlier cohorts.

U.S. HISTORICAL BREAST-FEEDING STATISTICS





Source: (1) Martinez, Gilbert A., Dodd, David, A. & Samartgedes, Jo Ann. (1981). Milk feeding patterns in the United States during the first 12 months of life. *Pediatrics, 68*(6), 863–866.
(2) Ryan, Alan S., Rush, David, Krieger, Fritz W. & Lewandowski, Gregory E. (1991). Recent declines in breast-feeding in the United States, 1984 through 1989. *Pediatrics, 88*(4), 719–727.
(3) Ryan, Alan S. (1997). The resurgence of breastfeeding in the United States. *Pediatrics, 99*(4), E12.
(4) Ryan, Alan S., Zhou, Wenjun & Acosta, Andrew. (2002). Breastfeeding continues to increase into the new millennium. *Pediatrics, 110*(6), 1103–1109. doi: 10.1542/peds.110.6.1103.
(5) Centers for Disease Control and Prevention. (2014). *Breastfeeding Among U.S. Children Born 2001–2011, CDC National Immunization Survey*. Atlanta, GA: National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention.
(6) Centers for Disease Control and Prevention. (2013, July). *Breastfeeding Report Card – United States, 2013*. Atlanta, GA: National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention.

RATES OF BREAST-FEEDING AROUND THE WORLD



[1] World Health Organization. (2014). Retrieved from http://www.who.int/nutrition/databases/infantfeeding/countries/en/
[2] Kramer, M. S., & Kakuma, R. (2012). Optimal duration of exclusive breastfeeding. *Cochrane Database of Systematic Reviews, 8*, CD003517. doi: 10.1002/14651858.CD003517.pub2.
[3] Rothenbacher, D., Weyermann, M., Beermann, C., & Brenner, H. (2009). Breastfeeding, atopic sensitization, and risk of recurrent wheezing in preschool children. *Archives of Pediatrics & Adolescent Medicine, 163*(3), 265–271. doi: 10.1001/archpediatrics.2008.574.
[4] Centers for Disease Control and Prevention. (2013). *Breastfeeding Report Card – United States, 2013*. Atlanta, GA: National Center for Chronic Disease Prevention and Health Promotion, Centers for

WHAT AN OBSERVER INFLUENCED BY EACH OF THE FIVE PERSPECTIVES MIGHT SAY ABOUT THESE STATISTICS

1 Psychoanalytic. The close mother-infant bond is crucial for the child's psychological development. Nations with lower rates of breast-feeding are likely to have higher rates of anxiety and depression among adults.

2 Behaviorist. Breast-feeding becomes habitual and reinforcing to both mother and child. That is why, among mothers who are breast-feeding at 6 months, many continue—even when nutritionally it is no longer needed.

3 Cognitive. Whether or not a woman breast-feeds depends on what she believes. That is why rates of breast-feeding have increased in Western nations over the past few decades.

4 Sociocultural. Cultural variations are apparent. All infants need to be fed, but the wide differences from place to place show that how babies are fed depends more on culture than on other factors.



MARKUN_LOPEZ MMG1 DESIGN/SHUTTERSTOCK

5 Evolutionary (or biological perspective). Evolutionary needs have always required breast-feeding, but women who wanted to be more "modern" moved away from it. As evolutionary factors have become better understood in the United States, breast-feeding is increasing.

SUMMARY

What Theories Do

1. A theory provides a framework of general principles to guide research and to explain observations. Each of the five major developmental theories—psychoanalytic, behaviorist, cognitive, sociocultural, and universal—interprets human development from a distinct perspective and organizes observation and research to aid comprehension of human experience and behavior.
2. Theories are neither true nor false. They are not facts; they suggest hypotheses to be tested. Good theories are practical: They aid inquiry, interpretation, and daily life.
3. A norm is a usual standard of behavior. Norms are not theories, although they may result from theories if a theory suggests that a certain behavior is proper. Norms are not necessarily good or bad, although sometimes differences from the norm are falsely considered deficits.

Psychoanalytic Theory: Freud and Erikson

4. Psychoanalytic theory emphasizes that human actions and thoughts originate from unconscious impulses and childhood conflicts. Freud theorized that sexual urges arise during three stages of childhood development—oral, anal, and phallic—and continue, after latency, in the genital stage. Conflict is inevitable in every stage.
5. Erikson described psychosocial, not psychosexual, stages. He described eight successive stages of development, each involving a crisis that must be resolved as people mature within their context. Societies, cultures, and family members shape each person's development.
6. All psychoanalytic theories stress the legacy of childhood. According to Freud, conflicts associated with children's erotic impulses have a lasting impact on adult personality. Erikson thought that the resolution of each crisis affects adult development.

Behaviorism: Conditioning and Social Learning

7. Behaviorists, or learning theorists, believe that scientists should study observable and measurable behavior. Behaviorism emphasizes conditioning—a lifelong learning process.
8. In classical behaviorism, there are two basic kinds of learning. One is classical conditioning, which describes the learning that occurs when one stimulus is linked to another. The other kind is operant conditioning, when the reinforcement or punishment that follows an action guides future behavior.
9. Social learning theory recognizes that people learn by observing others. Children are particularly susceptible to social learning, as they model their behavior, first after their parents and then after popular peers and famous people.

Cognitive Theory: Piaget and Information Processing

10. Cognitive theorists believe that thoughts and beliefs powerfully affect attitudes, actions, and perceptions.
11. Piaget proposed four age-related periods of cognition, each propelled by an active search for cognitive equilibrium. At every stage, assimilation and accommodation advance thinking.
12. Information processing focuses on each aspect of cognitive input, processing, and output. Neuroscience discoveries about how the brain functions have been particularly interesting for information processing theories.

Sociocultural Theory: Vygotsky and Beyond

13. Sociocultural theory explains human development in terms of the guidance, support, and structure provided by knowledgeable members of the society through culture and mentoring.
14. Vygotsky described how learning occurs through social interactions, in which mentors guide learners through their zone of proximal development.

The Universal Perspective: Humanism and Evolution

15. The universal perspective focuses on the shared impulses and common needs of all humanity. At their core, all humans are far more alike than different.
16. The two leaders of humanism—both Americans from the same cohort—were Maslow and Rogers. Maslow described five basic needs of all humans, following a sequence beginning with survival and ending with self-actualization. Rogers stressed the dignity of each person, who needs respect and appreciation (unconditional positive regard).
17. Evolutionary theory contends that contemporary humans inherit genetic tendencies that have fostered survival and reproduction of the human species for tens of thousands of years. Through selective adaptation, human genes are the underlying reason for many human behaviors, including gender differences, mental illness, and family bonds.

What Theories Contribute

18. Psychoanalytic, behavioral, cognitive, sociocultural, and universal theories have aided our understanding of human development, yet no single theory describes the full complexity and diversity of human experience. Most developmentalists are eclectic, drawing upon many theories.

KEY TERMS

developmental theory (p. 38)
norm (p. 39)
psychoanalytic theory (p. 40)
behaviorism (p. 43)
conditioning (p. 43)
classical conditioning (p. 43)
operant conditioning (p. 44)
reinforcement (p. 45)
social learning theory (p. 45)
modeling (p. 45)
cognitive theory (p. 47)
cognitive equilibrium (p. 48)
assimilation (p. 48)
accommodation (p. 48)
information-processing theory (p. 48)
sociocultural theory (p. 52)
apprenticeship in thinking (p. 52)
guided participation (p. 52)
zone of proximal development (p. 52)
humanism (p. 55)
selective adaptation (p. 58)
eclectic perspective (p. 61)

APPLICATIONS

1. Developmentalists sometimes talk about "folk theories," which are theories developed by ordinary people, who may not know that they are theorizing. Choose three sayings commonly used in your culture, such as (from the dominant U.S. culture) "A penny saved is a penny earned" or "As the twig is bent, so grows the tree." Explain the underlying assumptions, or theory, that each saying reflects.
2. Behaviorism has been used to change personal habits. Think of a habit you'd like to change (e.g., stop smoking, exercise more, watch less TV). Count the frequency of that behavior for a week, noting the reinforcers for each instance. Then, and only then, develop a substitute behavior, reinforcing yourself for it. Keep careful data for several days. What did you learn?
3. Ask three people to tell you their theories about male–female differences in mating and sexual behaviors. Which of the theories described in this chapter is closest to each explanation, and which theory is not mentioned?

CHAPTER 3

The New Genetics



What Will You Learn?

1. What is the relationship between genes and chromosomes?
2. Is twinning genetic or can a person choose to have twins?
3. How could a person have the gene for something that is never apparent?
4. If both parents have alcoholism, will their children have alcoholism, too?
5. Why are some children born with Down syndrome?

"She needs a special school. She cannot come back next year," Elissa's middle school principal told us.

We were stunned. Apparently the school staff thought that our wonderful daughter, bright and bubbly (Martin called her "frothy"), was learning disabled. They had a label for it: "severely spatially disorganized." We had noticed that she misplaced homework, got lost, left books at school, forgot where each class met on which day—but that seemed insignificant compared to her strengths in reading, analyzing, and friendship.

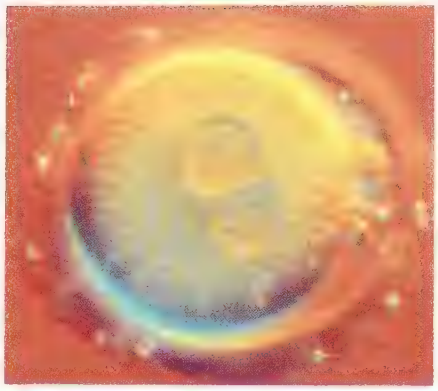
I knew the first lesson from genetics: Genes affect everything, not just physical appearance, intellect, and predisposition to specific diseases, so it dawned on me that Elissa had inherited our behavior patterns. Our desks were covered with papers; our home had assorted objects everywhere. If we needed masking tape, or working scissors, or silver candle sticks, we had to search in several places. Was that why we were unaware of Elissa's failings?

The second lesson from genetics is that nurture always matters. My husband and I had both learned to compensate for innate organizational weaknesses. Since he often got lost, Martin did not hesitate to ask strangers for directions; since I was prone to mislaying important documents, I kept my students' papers in clearly marked folders at my office. Despite our genes, we both were successful; we thought Elissa would be fine.

There is a third lesson. Whether or not a gene is expressed, that is, whether or not it actively affects a person, depends partly on the social context of that person's life. We determined not to let Elissa's genes impair her future. Because we now paid attention, we called our friends who gave us advice about how to help Elissa overcome her disability, including finding a professional tutor to teach spatial skills. Elissa began to list her homework assignments, check them off when done, put them carefully in her bag (not crumpled in the bottom), and then take her backpack to school.

We did our part: Martin attached her bus pass to her backpack; I wrote an impassioned letter telling the principal it would be unethical to expel her, we bought another

- The Genetic Code
  - What Genes Are
  - Variations
  - Matching Genes and Chromosomes
  - OPPOSING PERSPECTIVES: Too Many Boys?
- New Cells, New Functions
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  - Twins
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- From Genotype to Phenotype
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  - A CASE TO STUDY: Mickey Mantle
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LENNART NILSSON, SCANPIX

The Moment of Conception This ovum is about to become a zygote. It has been penetrated by a single sperm, whose nucleus now lies next to the nucleus of the ovum. Soon, the two nuclei will fuse, bringing together about 20,000 genes to guide development.

gamete A reproductive cell; that is, a sperm or ovum that can produce a new individual if it combines with a gamete from the other sex to make a zygote.

zygote The single cell formed from the union of two gametes, a sperm and an ovum.

deoxyribonucleic acid (DNA) The chemical composition of the molecules that contain the genes, which are the chemical instructions for cells to manufacture various proteins.

chromosome One of the 46 structures made of DNA (in 23 pairs) that almost every cell of the human body contains and that, together, contain all the genes. Other species have more or fewer chromosomes.

gene A small section of a chromosome; the basic unit for the transmission of heredity. A gene consists of a string of chemicals that provide instructions for the cell to manufacture certain proteins.

allele A variation that makes a gene different in some way from other genes for the same characteristics. Many genes never vary; others have several possible alleles.

Especially for Scientists A hundred years ago, it was believed that humans had 48 chromosomes, not 46; 20 years ago, it was thought that humans had 100,000 genes, not 20,000 or so. Why? (see response, page 70)

set of textbooks so she would have one at school and one at home. The three of us also toured other schools—aware that we needed to heed her school's principal, not simply disagree. Elissa understood that she might need a different school, so she studied diligently, hoping she would not need to leave her friends.

Success! Elissa aced her final exams, and the principal, somewhat reluctantly, allowed her to return. She became a good student all through high school and college, and is now a gifted strategist, a master organizer, an accomplished professional.

This chapter explains these three lessons. New scientific discoveries about genetics are published every day, leading to many ethical dilemmas and practical choices. I hope the implications of this chapter mean that you will never be stunned by what the school tells you about your middle-school child.

The Genetic Code

A reproductive cell is called a **gamete.** Every person begins life as a single cell, called a **zygote;** the zygote is the combination of two gametes, one sperm and one ovum. The zygote contains all a person's genes, which affect every aspect of development lifelong. Many people have misconceptions about heredity, so the beginning of this chapter is crucial to understanding human development.

What Genes Are

First, we review some biology. All living things are composed of cells. The work of cells is done by *proteins.* Each cell manufactures certain proteins according to a code of instructions stored by molecules of **deoxyribonucleic acid (DNA)** at the heart of the cell. These coding DNA molecules are on a **chromosome.**

Humans have 23 pairs of chromosomes (46 in all), which contain the instructions to make all the proteins that a person needs for life and growth (see Figure 3.1). The instructions in the 46 chromosomes are organized into genes, with each **gene** usually at a precise location on a particular chromosome. Humans have about 20,000 genes, each directing the formation of specific proteins, which are made from a string of 20 amino acids.

The instructions for making those amino acids are located on about 3 billion pairs of chemicals, called base pairs, arranged in precise order. A small variation—such as repeated pairs, or one missing pair—changes the gene a tiny bit. Although all humans have most of the same genes with identical codes, those tiny variations of certain genes make each person unique. Each variation of a particular gene is called an **allele** of that gene.

RNA (ribonucleic acid, another molecule) and additional DNA surround each gene. In a process called *methylation,* this additional material enhances, transcribes, connects, empowers, silences, and alters genetic instructions. This noncoding material used to be called *junk*—but no longer. The influences of this surrounding material "alter not the gene itself, but rather the regulatory elements that control the process of gene expression" (Furey & Sethupathy, 2013, p. 705). Methylation continues throughout life, from conception until death.

Obviously, genes are crucial, but even more crucial is whether or not a gene is expressed. The RNA regulates and transcribes genetic instructions, turning some genes and alleles on or off. In other words, a person can have the genetic tendency for a particular trait, disease, or behavior, but that tendency might never appear in that person's life because it was never turned on. Think of a light switch: A lamp might have a new bulb and an electricity source, but the room stays dark unless the switch is flipped.

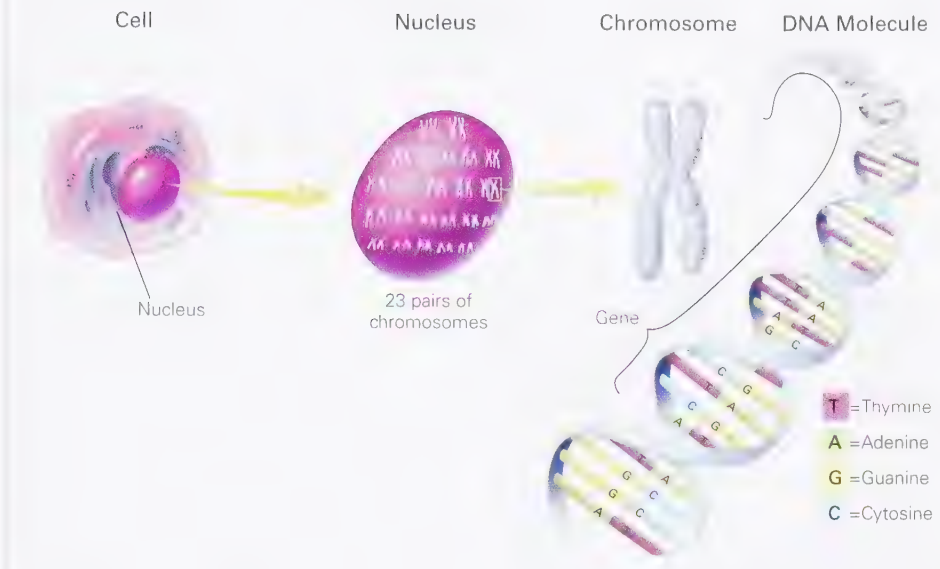


FIGURE 3.1
How Proteins Are Made The genes on the chromosomes in the nucleus of each cell instruct the cell to manufacture the proteins needed to sustain life and development. The code for a protein is the particular combination of four bases, T-A-G-C (thymine, adenine, guanine, and cytosine).

Some genetic activation occurs because of prenatal RNA, but some occurs because of later factors, biological (such as pollution) and psychological (as with social rejection). The study of exactly how genes change in form and expression is called **epigenetics,** with *epi* a Greek root meaning "around, above, below."

epigenetics The study of how environmental factors affect genes and genetic expression—enhancing, halting, shaping, or altering the expression of genes and resulting in a phenotype that may differ markedly from the genotype.

Researchers who sought a single gene for, say, schizophrenia, or homosexuality, or even something quite specific such as memory for math formulas, have been disappointed: No such genes exist. Instead, almost every trait arises from a combination of genes, each with a small potential impact. Then epigenetics is crucial: Events and circumstances surrounding the genes determine whether or not genes are expressed or stay silent (Ayyanathan, 2014).

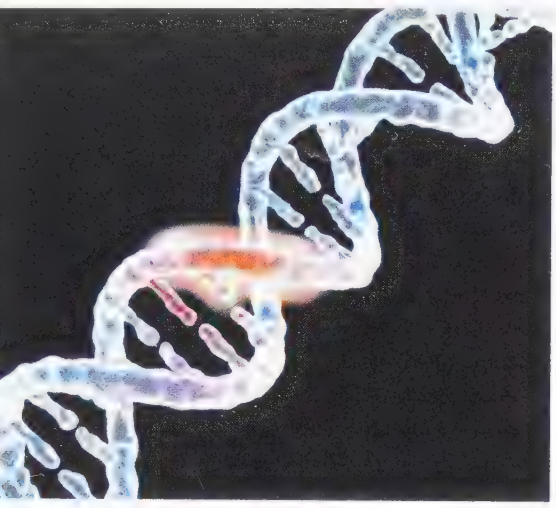
Variations

It is human nature for people to notice differences more than commonalities. All people are the same in many ways, not only with two eyes, hands, and feet, but also with the ability to communicate in language, the capacity to love and hate, and the wish for a meaningful life.

Alternate Forms

Nonetheless, each of us is distinct in small ways, not only because of our experiences but also because of our genes. Many scientists seek genetic causes for dissimilarities. Differences begin with alleles, some of which reflect transpositions, deletions, or repetitions of those 3 billion base pairs. Some genes are *polymorphic* (literally, "many forms") or, more formally, *single-nucleotide polymorphisms* (abbreviated SNPs, pronounced "snips"). Studying the impact of those SNPs is crucial for understanding why one person is unlike another.

Polymorphic genes can have two, three, or more versions. Most alleles seem inconsequential; some cause minor differences, such as the shape of an eyebrow or the shade of skin; a few rare ones are devastating. Several destructive alleles in combination with specific epigenetic conditions make a person develop schizophrenia, or diabetes, or some other serious problem (Plomin et al., 2013).



Twelve of 3 Billion Pairs This is a computer illustration of a small segment of one gene. Even a small difference in one gene can cause major changes in a person's phenotype

Two Parents, Millions of Gametes

Some variation springs from the simple fact that it takes two people to make one new person. Each parent contributes half the genetic material. Thus the 23 chromosomes from one parent, with their thousands of genes, match up with the 23 from the other, forming identical or nearly identical pairs. Chromosome 1 from the sperm matches with chromosome 1 from the ovum, chromosome 2 with chromosome 2, and so on through the 22nd pair.

On those chromosomes, each gene from one parent connects with its counterpart from the other parent, and the interaction between the two determines the inherited traits of the future person. Since some alleles from the father differ from the alleles from the mother, their combination produces a zygote unlike either parent. Thus each new person is a product of two parents but unlike either one.

Diversity at conception is increased by another fact: When a man or woman makes sperm or ova, and then their chromosomes pair up when they join, some genetic material is transferred from one chromosome to the other, a phenomena called jumping. As a result, "even if two siblings get the same chromosome from their mother, their chromosomes aren't identical" (Zimmer, 2009, p. 1254).

All these kinds of genetic diversity help societies, because creativity, prosperity, and even species survival is enhanced when one person is unlike another, although there are benefits when genes are shared as well. There is an optimal level of diversity and similarity: Human societies are close to that level (Ashraf & Galor, 2013).

The entire packet of instructions to make a living organism is called the **genome.** There is a genome for every species and variety of plant and animal—even for every bacterium and virus. Knowing the genome of *homo sapiens*, which was decoded in 2001, is only a start at understanding human genetics, since each individual has a slightly different set of those 3 billion base pairs.

genome The full set of genes that are the instructions to make an individual member of a certain species

The particular member of each chromosome pair from each parent on a given gamete is randomly selected. A man or woman can produce 2^{23} different gametes—more than 8 million versions of his or her own 46 chromosomes. If a given couple conceived a billion zygotes, each would be genetically unique because of the chromosomes of the particular sperm that fertilized that particular ovum. Interacting alleles, methylation, and other genetic forces add more variations to the zygote. Epigenetic influences silence some genes and allow expression of others. Nurture creates even more variations.

// Response for Scientists (from page 68). There was some scientific evidence for the wrong numbers (e.g., chimpanzees have 48 chromosomes), but the reality is that humans tend to overestimate many things, from the number of genes to their grade on the next test. Scientists are very human: They tend to overestimate until the data prove them wrong.

Matching Genes and Chromosomes

The genes on the chromosomes constitute the organism's genetic inheritance, or **genotype,** which endures throughout life. Growth requires duplication of the code of the original cell again and again.

genotype An organism's entire genetic inheritance, or genetic potential.

Matching Autosomes

In 22 of the 23 pairs of chromosomes, both members of the pair are closely matched. As already explained, some of the specific genes have alternate alleles, but at least each of these 44 chromosomes finds its comparable chromosome, making a pair. Those 44 chromosomes are called *autosomes*, which means that they are independent (*auto* means "self") of the sex chromosomes (the 23rd pair).

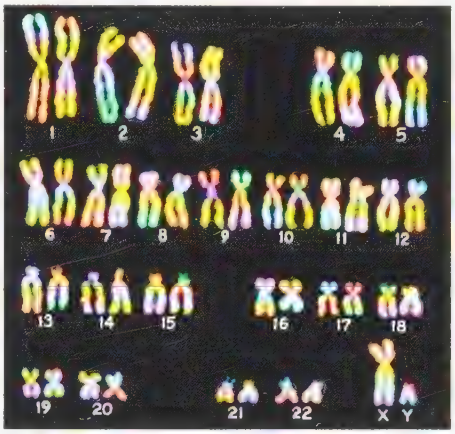
Each autosome, from number 1 to number 22, contains hundreds of genes in the same positions and sequence. If the code of the gene from one parent is exactly like the code on the same gene from the other parent, the gene pair is **homozygous** (literally, "same-zygote").

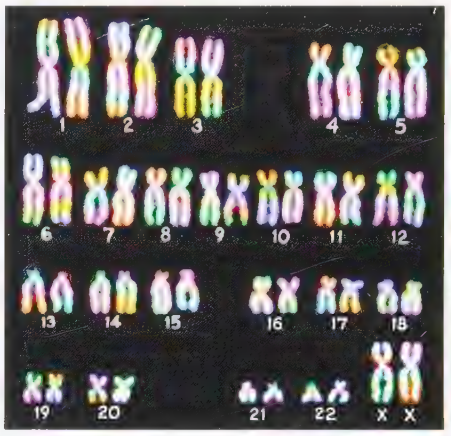
homozygous Referring to two genes of one pair that are exactly the same in every letter of their code. Most gene pairs are homozygous

However, the match is not always letter perfect because the mother might have a different allele of a particular gene than the father has. If a gene's code differs from that of its counterpart, the two genes still pair up, but the zygote (and, later, the person) is **heterozygous.** This can occur with any of the gene pairs, on any of the autosomes. Which particular homozygous or heterozygous genes my brother and I inherited from our parents was purely a matter of chance, and had no connection to the fact that I am a younger sister, not an older brother.

Sex Chromosomes

However, for the **23rd pair** of chromosomes, my sex reveals a marked difference between my brother and me. My 23rd pair matched, but his did not. In that he was like all males: When gametes combine to form the zygote, half of the time a dramatic mismatch occurs. In males, the 23rd pair has one X-shaped chromosome and one Y-shaped chromosome. It is called **XY.** In females, the 23rd pair is composed of two X-shaped chromosomes. Accordingly, it is called **XX.**





© PHOTO ASSOCIATES / SCIENCE SOURCE

Uncertain Sex Every now and then, a baby is born with "ambiguous genitals," meaning that the child's sex is not abundantly clear. When this happens, a quick analysis of the chromosomes is needed, to make sure there are exactly 46 and to see whether the 23rd pair is XY or XX. The karyotypes shown below indicate a normal baby boy (*left*) and girl (*right*).

Because a female's 23rd pair is XX, all of a mother's ova contain either one X or the other—but always an X. And because a male's 23rd pair is XY, half of a father's sperm carry an X chromosome and half a Y. The X chromosome is bigger and has more genes, but the Y chromosome has a crucial gene, called *SRY*, that directs the embryo to make male hormones and organs. Thus, sex depends on which sperm penetrates the ovum—a Y sperm with the SRY gene, creating a boy (XY), or an X sperm, creating a girl (XX) (see Figure 3.2).

heterozygous Referring to two genes of one pair that differ in some way. Typically one allele has only a few base pairs that differ from the other member of the pair.

23rd pair The chromosome pair that, in humans, determines sex. The other 22 pairs are autosomes, inherited equally by males and females.

XY A 23rd chromosome pair that consists of an X-shaped chromosome from the mother and a Y-shaped chromosome from the father. XY zygotes become males.

XX A 23rd chromosome pair that consists of two X-shaped chromosomes, one each from the mother and the father. XX zygotes become females.

Possible Combinations of Sex Chromosomes

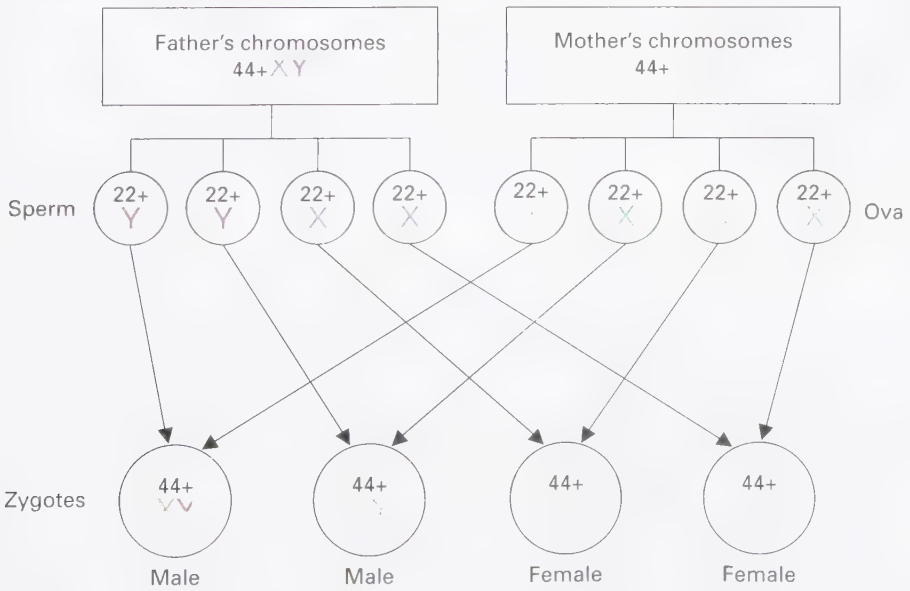


FIGURE 3.2

Determining a Zygote's Sex Any given couple can produce four possible combinations of sex chromosomes; two lead to female children and two to male. In terms of the future person's sex, it does not matter which of the mother's Xs the zygote inherited. All that matters is whether the father's Y sperm or X sperm fertilized the ovum. However, for X-linked conditions it matters a great deal because typically one, but not both, of the mother's Xs carries the trait.

In some other species, sex is not determined at conception. In certain reptiles, for instance, temperature during incubation of the fertilized egg affects the sex of the embryo (Hare & Cree, 2010). However, for humans, the zygote is either XX or XY, a fact that in the past was not revealed to anyone until the baby was born. Pregnant women ate special foods, slept in a particular way, or repeated certain prayers, all in a vain attempt to control the sex of their fetus—who had been male or female at conception.

Today, sex can be known much earlier: Parents choose names, decorate nurseries, and bond with the future boy or girl—or reject him or her, as the Opposing Perspectives explains. A zygote's sex cannot be changed.

SUMMING UP The normal human genome contains approximately 20,000 genes on exactly 46 chromosomes, using an estimated 3 billion base pairs of code to make a person. Some genes, called alleles, are polymorphic. Because of small differences

opposing perspectives

Too Many Boys?

Parents can choose the sex of their newborn. Millions of couples have done this. Is this a problem?

The birth of a child of unwanted sex can be prevented long before birth in three ways: (1) by inactivating X or Y sperm before conception, (2) by inserting only the male or female zygotes after in vitro conception, or (3) by aborting XX or XY fetuses. Should all or some of these three methods be banned? In at least 36 nations, prenatal sex selection is illegal, but not in the United States (Murray, 2014).

One nation that forbids prenatal sex selection is China. This was not always so. In about 1979, China began a "one-child" policy, urging and sometimes forcing couples to have only one child. That may have helped achieve the intended goal: reduction of poverty caused by too many dependent children. But the Chinese government did not anticipate advances in prenatal testing, nor realize the strength of the tradition that sons, not daughters, should care for aged parents. An unintended consequence was that many parents chose to have their only child be a boy. Among the unanticipated results over several decades were: (1) almost a million abortions of female fetuses, (2) thousands of newborn girls available for adoption, and, currently (3) far more unmarried young men than women.

In 1993, the Chinese government forbade prenatal testing for sex selection. Many couples broke the law. In 2013, China rescinded the one-child policy. Yet from 2015–2020, according to the best projections from the population division of United Nations secretariat, 115 males will be born for every 100 females. Since the natural sex ratio at birth is 104:100, it is evident that selective abortion is expected to continue.

Indeed, sex preferences are apparent in every nation. One elderly Indian man said, "We should have at least four children per family, three of them boys" (quoted in Khanna, 2010, p. 66).



MANISH SWARUP AP PHOTO

My Strength, My Daughter That's the slogan these girls in New Delhi are shouting at a demonstration against abortion of female fetuses in India. The current sex ratio of children in India suggests that this campaign has not convinced every couple.

in their genetic codes, those alleles make each person unlike any other. The result is that each person is unique yet similar to all other humans. The entire instruction code is the genome, contained in a single cell called the zygote. Each person's genetic code (their genotype) is expressed because of many environmental influences, an interaction called epigenetics, which produces the phenotype. This is true even for one's sex, which is determined by a pair of chromosomes, but maleness and femaleness are expressed in many ways.

WHAT HAVE YOU LEARNED?

1. How many pairs of chromosomes and how many genes does a person usually have?
2. What causes the similarities of all humans?
3. Why do two sisters or two brothers in the same family differ genetically?
4. Which is more important for a person's daily life, the phenotype or genotype, and why?
5. What determines whether a baby will be a boy or a girl?

Couples of Asian ancestry in the United States also have a disproportionate number of boys (Puri et al., 2011). In some Western nations, including Germany, girls are preferred—both as newborns and as caregivers of the old (Wilhelm et al., 2013).

The argument in favor of sex selection is freedom to choose. Some fertility doctors in the United States believe that reproductive rights include that each couple be able to decide how many children to have, and what sex they should be (Murray, 2014). Some people who themselves would not abort a fetus nonetheless favor personal freedom—in this case, freedom to "balance" the family.

Why would anyone object to freedom? The Chinese experience shows that sex selection can have unanticipated consequences. For instance, now many more young Chinese men than women die prematurely. The developmental explanation is that unmarried young men in every culture take risks to attract women and become depressed if they remain single when they want marriage and fatherhood.

Other problems may occur. Males are more likely to be learning disabled, drug addicted, and criminal; they're also more likely to start wars, commit suicide, and suffer heart attacks. Any nation with more men than women may experience increases in all these problems.

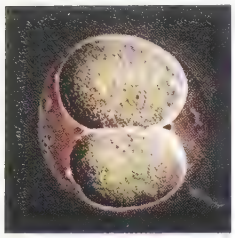
But wait: Chromosomes and genes do not determine behavior. Every sex difference is a product of culture. Even traits that originate with biology, such as the propensity to heart attacks, are affected more by environment (in this case, diet and cigarettes) than by XX or XY chromosomes. Perhaps nurture could change if nature produced more males than females, and then societies would not suffer. The frequency of sex selection is influenced by national policy and cultural values (Parker, 2012).

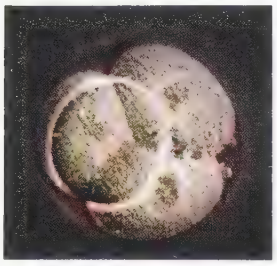


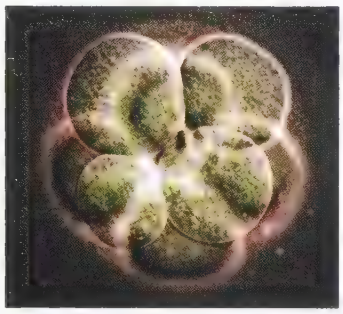
STR/AFP/GETTY IMAGES

Mama Is 60 Wu Jingzhou holds his newborn twin daughters, born to his 60-year-old wife after in vitro fertilization. Ordinarily, it is illegal in China, as in most other nations, for women to have children after menopause. But an exception was made for this couple since the death of their only child, a young woman named Tingling, was partly the government's fault.

Might laws against prenatal sex choices be unnecessary if culture could shift? "Might" . . . "if" . . . Critical thinking needed







Still Stems But not much longer. These three photos show early cell duplication and division, with each new cell exactly like the others, with all the genetic instructions to make a whole person, or any cell of a person's body. A technician could remove one cell and test it for defects, and the remaining cells would still grow into a fetus as if nothing had happened. But in another 24 hours, that is impossible—the stem cells would begin to differentiate and any removal might be lethal.

stem cells Cells from which any other specialized type of cell can form.

New Cells, New Functions

Within hours after conception, the zygote begins *duplication* and *division*. First, the 23 pairs of chromosomes carrying all the genes duplicate to form two complete sets of the genome. These two sets move toward opposite sides of the zygote, and the single cell splits neatly down the middle into two cells, each containing the original genetic code. These two cells duplicate and divide, becoming four, which duplicate and divide, becoming eight, and so on.

The name of the developing mass of cells changes as it multiplies—from morula to blastocyst, from embryo to fetus—and finally, at birth, baby. (**Developmental Link:** Prenatal growth is detailed in Chapter 4.)

Every Cell the Same

Nine months after conception, a newborn has about 26 billion cells, all influenced by whatever nutrients, drugs, hormones, viruses, and so on came from the pregnant woman. Almost every human cell carries a complete copy of the genetic instructions of the one-celled zygote.

Adults have about 37 trillion cells, each with the same 46 chromosomes and the same thousands of genes of the original zygote (Bianconi, et al., 2013). This explains why DNA testing of any body cell, even from a drop of blood or a snip of hair, can identify "the real father," "the guilty criminal," "the long-lost brother." DNA lingers long after death. Some living African Americans claimed Thomas Jefferson as an ancestor: DNA testing proved some of them right and some of them wrong (Foster et al., 1998).

Indeed, because the Y chromosome is passed down to every male descendant, and because the genes on the Y typically do not change much from one generation to another, men have the Y of a male ancestor who died thousands of years ago.

Tracing the Y chromosome suggests that thousands of East Asian men may be descendants of Genghis Khan—although that twelfth-century leader's bones and thus his DNA have never been found (Stoneking & Delfin, 2010). Such genetic sleuthing is not totally reliable: It is quite possible to trace ancestry for several generations; it is much more complex to go back for hundreds of years. But history suggests Khan may have impregnated many women.

Stem Cells

The cells that result from the early duplication and division are called **stem cells;** these cells are able to produce any other cell and thus to become a complete person. Indeed, as later described, sometimes these cells split apart and each becomes an identical twin.

After about the eight-cell stage, although duplication and division continue, a third process, *differentiation*, begins. In differentiation, cells specialize, taking different forms and reproducing at various rates depending on where they are located. For instance, some cells become part of an eye, others part of a finger, still others part of the brain. They are no longer stem cells. Blood cells in the umbilical cord, however, may act like stem cells.

Scientists have discovered ways to add genes to certain differentiated cells in a laboratory process that reprograms those cells, making them like stem cells again. However, scientists do not yet know how to use reprogrammed stem cells to cure genetic conditions without harming other cells. In fact, there are many kinds of stem cells, and thousands of potential uses (Slack, 2012).

One use of reprogrammed cells has been found: to test drugs to treat diseases caused by genes, either directly (such as sickle-cell anemia) or indirectly (such as heart disease, diabetes, and dementia) (Zhu & Huangfu, 2013; Vogel, 2010).

Some restrictions on stem cell research in the United States were lifted in 2009, and some states (e.g., California) and nations (e.g., South Korea) allow more extensive research, but everywhere many ethical and practical issues remain (Nguyen et al., 2013). As the head of the Michael J. Fox Foundation for Parkinson's Research said, "All my exposure was pop media. I thought it was all about stem cells. I have not totally lost hope on cell replacement, I just don't think it's a near-term hope" (Hood, quoted in Holden, 2009).

The Placenta

One of the first signs of differentiation is the formation of the placenta, the organ that sustains the developing person throughout pregnancy. The outer cells of the blastocyst surround the inner cells, even before differentiation of body cells has begun, soon creating tiny blood vessels called villi that will connect the mother to the embryo via the umbilical cord. Those blood vessels exchange waste products from the fetus and nourishment from the mother to enable growth and life.

In some cultures, the placenta is revered and ceremoniously buried once the baby is born. In the United States it is usually discarded, "a throwaway organ" that deserves more respect (Kaiser, 2014, p. 1073).

The fact that the placenta is formed from the early duplicating cells allows early genetic testing. In chorionic villus sample (CVS), a sample of the placental blood is removed and analyzed. Many chromosomal and genetic disorders can be detected at this early stage.

Later in pregnancy, cells from the fetus are sloughed off and circulate in the amniotic fluid, and these can also be removed and analyzed in a process called amniocentesis. (**Developmental Link:** Chromosomal and genetic disorders are discussed at the end of this chapter.)

Twins

Thus far we have described conception as if one sperm fertilized one ovum, beginning the process of duplication and differentiation. But that is not always the case. To understand multiple conceptions, you need to know the difference between monozygotic and dizygotic twins (see Visualizing Development, p. 76).



Video Activity: Identical Twins: Growing Up Apart gives a real-life example of how genes play a significant role in people's physical, emotional, social, and mental development.

Monozygotic Twins

Although every zygote is genetically unique, about once in 250 human conceptions duplication results in one or more complete splits, creating two, or four, or even eight separate zygotes, each identical to the first single cell. This creation of identical embryos has been done experimentally for lower animals, but it is illegal for humans in a laboratory. However, nature does it occasionally in the first hours after conception. (An incomplete split creates *conjoined twins*, formerly called Siamese twins.)

If each of those separated cells from one zygote then duplicates, divides, differentiates, implants, grows, and survives, multiple births occur. One separation results in **monozygotic (MZ) twins,** from one (*mono*) zygote (also called *identical twins*). Two or three separations create monozygotic quadruplets or octuplets.

monozygotic (MZ) twins Twins who originate from one zygote that splits apart very early in development. (Also called *identical twins*.) Other monozygotic multiple births (such as triplets and quadruplets) can occur as well.

Because monozygotic multiples originate from the same zygote, they have virtually identical genetic instructions for appearance, psychological traits, disease vulnerability, and everything else genetic. Remember, however, that epigenetic influences begin as soon as conception occurs: Monozygotic twins look very much alike, but their environment can influence their development in many ways that distinguish one from the other.

Monozygotic twins are blessed in some ways: They can donate a kidney or other organ to their twin with no organ rejection, thus avoiding major complications

EVALUATING DEVELOPMENT

One Baby or More

Humans usually have one baby at a time, but sometimes twins are born. Most often they are from two ova fertilized by two sperm (*lower left*), resulting in dizygotic twins. Sometimes, however, one zygote splits in two (*lower right*), resulting in monozygotic twins; if each of these zygotes splits again, the result is monozygotic quadruplets.



with surgical transplants. On a lighter note, they can also befuddle their parents and teachers, who may use special signs (such as different earrings) to tell them apart. Usually, the twins themselves find their own identities while enjoying twinship. They might enjoy inherited athletic ability, for instance, with one playing basketball and the other soccer.

As one monozygotic twin writes:

> Twins put into high relief *the* central challenge for all of us: self-definition. How do we each plant our stake in the ground, decide how sensitive, callous, ambitious, cautious, or conciliatory we want to be every day? . . . Twins come with a built-in constant comparison, but defining oneself against one's twin is just an amped-up version of every person's life-long challenge: to individuate, to create a distinctive persona in the world.
>
> *[Pogrebin, 2010, p. 9]*

Dizygotic Twins

Among naturally conceived twins, only about one in five pairs is monozygotic. About once in 60 conceptions, **dizygotic (DZ) twins** are conceived. They are also called *fraternal twins*, although since *fraternal* means "brotherly" (as in fraternity), the term is inaccurate. DZ twins are as likely to be two girls, or a boy and a girl, as two boys. In every case, dizygotic twins began life as two separate zygotes created by two ova fertilized by two sperm at the same time. (Usually, women release only one ovum per month, but sometimes double or triple ovulation occurs, a tendency that is affected by genes.)

dizygotic (DZ) twins Twins who are formed when two separate ova are fertilized by two separate sperm at roughly the same time. (Also called *fraternal* twins.)

People sometimes say that twinning "skips a generation" but that also is not accurate. What it skips is fathers—but not exactly. Since dizygotic twinning depends on multiple ovulation, the likelihood of a woman bearing twins depends on her genes, not her husband's. However, a man has half his genes from his mother. If multiple ovulation is in his family, he will not produce twins, but if the X he inherited from his mother is the one that encouraged multiple ovulation, his daughters (who always get his X) might.

When dizygotic twinning occurs naturally, the incidence varies by ethnicity. For example, about 1 in 11 Yorubas in Nigeria is a twin, as are about 1 in 45 European Americans, 1 in 75 Japanese and Koreans, and 1 in 150 Chinese. Age matters, too: Older women more often double-ovulate and thus have more twins.

After twins are conceived, their chance of survival until birth depends on the prenatal circumstances. An early sonogram might reveal two developing organisms, but later only one embryo continues to grow. This *vanishing twin* phenomenon may occur in about 12 percent of pregnancies (Giuffrè et al., 2012).

Like all full siblings, DZ twins have about half of their genes in common. They can differ markedly in appearance, or they can look so much alike that only genetic tests can determine whether they are monozygotic or dizygotic.

Chance determines which sperm fertilizes each ovum, so about half are same-sex pairs and half are boy–girl pairs. Of course, in the rare incidence that a woman releases two ova at once and also has sex with two different men over a short period, it is possible for fraternal twins to have different fathers and thus share only a fourth of the same genes.

Assisted Reproduction

The statistic above—twins born about once in 60 pregnancies—refers to natural conception. However, the twin birth rate has increased by 50 percent in the past two decades, and the triplet birth rate has doubled. The primary reason is that

when couples want children but are infertile (a condition affecting about 12 percent of U.S. couples), about half of them choose **assisted reproductive technology (ART).**

assisted reproductive technology (ART) A general term for the techniques designed to help infertile couples conceive and then sustain a pregnancy.

Infertility

Infertility is defined as failure to conceive a child after a year of trying. Rates vary by nation, primarily because of the quality of medical care and the incidence of sexually transmitted infections, many of which cause infertility. About one-third of all fertility problems originate in the woman, about one-third in the man, and in about one-third, the cause is unknown.

Some couples are subfertile, that is, less fertile than ideal but not sterile. It is not unusual for a couple to believe they are infertile, begin ART or adoption, and then spontaneously conceive. For subfertile couples, one developmental factor falls more heavily on women. Although both sexes become less fertile every year beginning at about age 18, for women the decline is steeper. Pregnancy after age 40 is unusual, and menopause (naturally at about age 50) makes ovulation impossible. By contrast, men produce sperm lifelong.

Since age is a factor, if a couple have trouble conceiving, they should consult a fertility specialist as soon as they can. The simplest cause is that the ovaries do not release ova. In that case, a woman can take a drug (usually Clomid) to cause ovulation. The drug may cause release of several ova at once, causing multiple births and risking preterm birth—a risk many are willing to take.

Another relatively simple solution appears when the man produces no viable sperm. In that case, the woman can be inseminated with another man's sperm, a procedure that usually does not include any personal contact between the man who donates sperm (stored in a laboratory) and the woman. Doctors have used this method of fertilizing an ovum for more than 100 years.

In Vitro Fertilization

In the twenty-first century, the most common ART method is **in vitro fertilization (IVF),** "a relatively routine way to have children, with an estimated 5 million babies born to date" (Thompson, 2014, p. 361). In this method, ova are surgically removed from an ovary, fertilized in a lab dish (*in vitro* means "in glass"), and then inserted into the uterus.

in vitro fertilization (IVF) Fertilization that takes place outside a woman's body (as in a glass laboratory dish). The procedure involves mixing sperm with ova that have been surgically removed from the woman's ovary. If a zygote is produced, it is inserted into a woman's uterus, where it may implant and develop into a baby.

intra-cytoplasmic sperm injection (ICSI) An in vitro fertilization technique in which a single sperm cell is injected directly into an ovum.

Often, a sperm is inserted directly into each ovum to improve the odds of fertilization, in a procedure called **intra-cytoplasmic sperm injection (ICSI).** Zygotes that fail to duplicate, or blastocysts tested positive for serious genetic diseases, are rejected. Many women ask that several fertilized ova be inserted: twins or even triplets seem like a bonus when a couple has been infertile for years.

Doctors have refined this procedure since the first IVF baby, Louise Brown, was born in England in 1978. Now they wait two to six days after conception, making sure division and duplication occur smoothly, before inserting the developing cells into the uterus. Between 1 and 3 percent of all newborns in developed nations and thousands more in developing nations are the result of IVF, making one scholar call IVF "a new norm of family life" (Franklin, 2013, p. 30).

Those numbers allow careful, longitudinal research. In general, IVF children develop as well as other children. A slightly higher risk of birth complications is evident, but that might not be directly from the IVF procedure but rather from other conditions common in such pregnancies: older parents and low birthweight (Fauser et al., 2014).

ART has enabled millions of couples to have children. Indeed, some parents have children who are not genetically or biologically theirs if others donate the

sperm, the ova, and/or the womb. The word *donate* may be misleading, since most donors—often college students—are paid for their sperm, ova, or pregnancy.

The reality that three people could contribute to the birth of a baby before someone else becomes the child's parent evokes moral issues. Increasingly, the "real" parents are thought to be those who raise a child, not those who conceive it, although not everyone agrees with this view (Franklin, 2013). Whether with their own gametes or someone else's, most people who become parents via IVF are married heterosexuals, but ART makes parenthood possible for many others, including single parents and same-sex couples.

Some nations forbid IVF to many who wish it, asking not only for proof of marriage but sometimes proof of financial and emotional health (as in Switzerland). Several European nations limit the numbers of blastocysts inserted into the uterus at one time, partly because national health care pays for both IVF and newborn care. According to research in seven nations, inserting just one blastocyst results in as many successful pregnancies as inserting multiple blastocysts, with fewer low-birthweight newborns (7 percent compared to 30 percent), primarily because each fetus develops alone (Grady et al., 2012).

The United States has no legal restrictions on IVF, although the procedure is expensive (about $20,000 for all the drugs and monitoring as well as the procedure itself) and not covered by insurance, which makes it beyond the reach of many couples. Medical societies provide some oversight. For example, the California Medical Board removed his license to practice medicine from the physician who inserted 12 blastocysts in Nadya Suleman. She gave birth to eight surviving babies in 2009, a medical miracle but a developmental disaster.

SUMMING UP The genes of the zygote duplicate themselves again and again. Although the first cells are stem cells, and therefore each could become a whole person, soon the cells differentiate as they multiply. Each cell becomes a particular type, traveling to the location on the body where it will perform whatever is needed, becoming skin, blood, bone, part of the brain, and so on.

Twins are monozygotic (one zygote, from the same stem cells) or dizygotic (two zygotes). Dizygotic twins occur if a woman ovulates two ova at once, but many couples have the opposite problem—no conception at all. Fertility measures help about half of such couples to conceive, via assisted reproductive technology (ART). The best-known measure of ART currently is in vitro fertilization, which can help when either the male or the female is subfertile. ART raises many ethical issues, especially when the donors of the sperm and/or ovum are not the parents of the offspring. An additional issue is that the rate of preterm and low-birthweight births increases if two or more zygotes are implanted.

WHAT HAVE YOU LEARNED?

1. How does differentiation affect stem cells?
2. What are the advantages and disadvantages of being a monozygotic twin?
3. What are the genetic similarities between monozygotic and dizygotic twins?
4. What ART measures help a woman who is infertile?
5. What ART measures help a man who is infertile?
6. What international differences are apparent in IVF?

From Genotype to Phenotype

As already explained, when a sperm and ovum create a zygote, they establish the *genotype:* all the genes of the developing person. That begins several complex

phenotype The observable characteristics of a person, including appearance, personality, intelligence, and all other traits.

polygenic Referring to a trait that is influenced by many genes.

multifactorial Referring to a trait that is affected by many factors, both genetic and environmental, that enhance, halt, shape, or alter the expression of genes, resulting in a phenotype that may differ markedly from the genotype.

- processes that combine to form the **phenotype**—the person's appearance, behavior, and brain and body functions. Nothing is totally genetic, not even such obvious traits as height or hair color, but nothing is untouched by genes, including working overtime or not at all, wanting or refusing a divorce, or becoming a devoted or a rejecting parent (Plomin et al., 2013).

The genotype instigates body and brain formation, but the phenotype depends on many genes and on the environment. The phenotype is influenced from the moment of conception until the moment of death, sometimes directly (epigenetic) and sometime via cultural and familial circumstances.

Almost every trait is **polygenic** (affected by many genes) and **multifactorial** (influenced by many factors). A zygote might have the alleles for becoming, say, a musical genius, but that potential may never be expressed. Accurate prediction of the phenotype is impossible, even if the genotype is entirely known (Lehner, 2013).

Almost daily, researchers describe additional complexities in polygenic and multifactorial interaction. It is apparent that "phenotypic variation . . . results from multiple interactions among numerous genetic and environmental factors." To describe this "fundamental problem of interrelating genotype and phenotype in complex traits" (Nadeau & Dudley, 2011, p. 1015), we begin with epigenetics.

COURTESY KATE NURRE



Sisters, But Not Twins, In Iowa From their phenotype, it is obvious that these two girls share many of the same genes, as their blond hair and facial features are strikingly similar. And you can see that they are not twins; Lucy is 7 years old and Ellie is only 4. It may not be obvious that they have the same parents, but they do—and they are both very bright and happy because of it. This photo also shows that their genotypes differ in one crucial way: One of them has a dominant gene for a serious condition.

OBSERVATION QUIZ Who has that genetic condition? (see answer, page 82)

Epigenetics

All important human characteristics are *epigenetic;* this applies also to diseases that are known to be inherited, such as cancer, schizophrenia, and autism (Kundu, 2013; Plomin et al., 2013).

Type 2 diabetes is a notable example. People who inherit genes that put them at risk do not always become diabetic. However, lifestyle factors might activate that genetic risk. If that happens, epigenetic changes to the genes make diabetes irreversible: Diet and insulin may control the disease, but the pre-diabetic state never returns (Reddy & Natarajan, 2013).

One intervention—bariatric surgery to dramatically reduce weight—leads to remission of diabetes in most (72 percent) patients, but over the years full diabetes returns for more than half of them. Crucial is conscientious diet and exercise for decades; remission is possible, but the disease is latent, never disappearing because genetic changes cannot be erased (Sjöström et al., 2014).

The same may be true for other developmental changes over the life span. Drug use—cocaine, cigarettes, alcohol, and so on—may produce epigenetic changes that make addiction likely, even if a person has stopped using the drug for years (Bannon et al., 2014). Treatment and other factors help, of course, but the addict can never use the drug again as an unaffected person would.

In general, environmental influences (such as injury, temperature extremes, drug abuse, and crowding) can impede healthy development, whereas others (nourishing food, loving care, play) can facilitate it, all because of differential susceptibility and epigenetic change. A recent discovery is that some environmental factors that suppress or release genes are cognitive, not biological.

For example, if a person feels lonely and rejected, that feeling can affect the RNA, which allows genetic potential for heart disease or social anxiety to be expressed (Slavich & Cole, 2013). Note that the *feeling* of loneliness, not the objective number of friends or social contacts, has significant epigenetic influence.

No trait—even one with strong, proven genetic origins, such as blood pressure or severe depression—is determined by genes alone because "development is an epigenetic process that entails cascades of interactions across multiple levels of causation, from genes to environments" (Spencer et al., 2009, p. 80). Because epigenetic influences occur lifelong, latent genes can become activated at any point.

A surprising example might be political ideology: Several researchers report that a particular allele of a dopamine receptor gene (DRD4-R7) correlates with being liberal, but only if a person has many friends. Loners, even with the liberal-leaning allele, are more conservative (Settle et al., 2010). Genotype alone does not determine phenotype for any psychological trait, but the double whammy—genes and environment—does.

Gene–Gene Interactions

Many discoveries have followed the completion of the **Human Genome Project** in 2001. One of the first surprises was that humans have far fewer than 100,000 genes, the number often cited in the twentieth century. A person has a total of about 20,000 genes.

Human Genome Project An international effort to map the complete human genetic code. This effort was essentially completed in 2001, though analysis is ongoing.

The precise number is elusive because—another surprise—it is not always easy to figure out where one gene starts and another ends, or if a particular stretch of DNA is actually a gene (Rouchka & Cha, 2009). Nor is it always easy to predict exactly how the genes from one parent will interact with the genes from the other. We do, however, know some basics of genetic interaction, as described now.

Additive Heredity

Some genes and alleles are *additive* because their effects *add up* to influence the phenotype. When genes interact additively, the phenotype usually reflects the contributions of every gene that is involved. Height, hair curliness, and skin color, for instance, are usually the result of additive genes. Indeed, height is probably influenced by 180 genes, each contributing a very small amount (Enserink, 2011).

Especially for Future Parents Suppose you wanted your daughters to be short and your sons to be tall. Could you achieve that? (see response, page 83)

Most people have ancestors of varied height, hair curliness, skin color, and so on, so their children's phenotype does not mirror the parents' phenotypes (although the phenotype always reflects the genotype). I see this in my family: Our daughter Rachel is of average height, shorter than her father or me, but taller than either of our mothers. She apparently inherited some of her grandmothers' height genes via our gametes. And none of my children have exactly my skin color—



Genetic Mix Dizygotic twins Olivia and Harrison have half their genes in common, as do all siblings from the same parents. If the parents are close relatives, who themselves share most alleles, the non-shared half is likely to include many similar genes. That is not the case here, as mother (Nicola) is from Wales and father (Gleb) is from the nation of Georgia, which includes many people of Asian ancestry. Their phenotypes, and the family photos on the wall, show many additive genetic influences.

ANSWER TO OBSERVATION QUIZ (from page 80) Ellie has a gene for achondroplasia, the most common form of dwarfism, which affects her limb growth, making her a little person. Because of her parents and her sister, she is likely to have a long and accomplished life: Her problems are less likely to come from her genotype than from how other people perceive her phenotype.

apparent when we borrow clothes from each other and are distressed that a particular shade is attractive on one but ugly on another.

How any additive trait turns out depends partly on all the genes a child happens to inherit (half from each parent, which means one-fourth from each grandparent). Some genes amplify or dampen the effects of other genes, aided by all the other DNA and RNA (not junk!) in the zygote (Pauler et al., 2012).

Dominant–Recessive Heredity

Not all genes are additive. In one non-additive form, alleles interact in a **dominant–recessive pattern,** when one allele, the *dominant gene*, is more influential than the other, the *recessive gene*. The dominant gene controls the expression of a characteristic even when a recessive gene is the other half of a pair.

dominant–recessive pattern The interaction of a heterozygous pair of alleles in such a way that the phenotype reflects one allele (the dominant gene) more than the other (the recessive gene).

Everyone has recessive genes that are not apparent in the phenotype. For instance, no one would guess, simply by looking at me, that my mother had to stretch to reach 5'4." But Rachel has half of her genes from me, and one of my height genes may be recessive. Every person is a **carrier** of recessive genes, *carried* on the genotype but not expressed in the phenotype.

carrier A person whose genotype includes a gene that is not expressed in the phenotype. The carried gene occurs in half of the carrier's gametes and thus is passed on to half of the carrier's children. If such a gene is inherited from both parents, the characteristic appears in the phenotype.

Most recessive genes are harmless. For example, blue eyes are determined by a recessive allele and brown eyes by a dominant one, so a child conceived by a blue-eyed parent (who always has two recessive blue-eye genes) and a brown-eyed parent will usually have brown eyes. No harm in that.

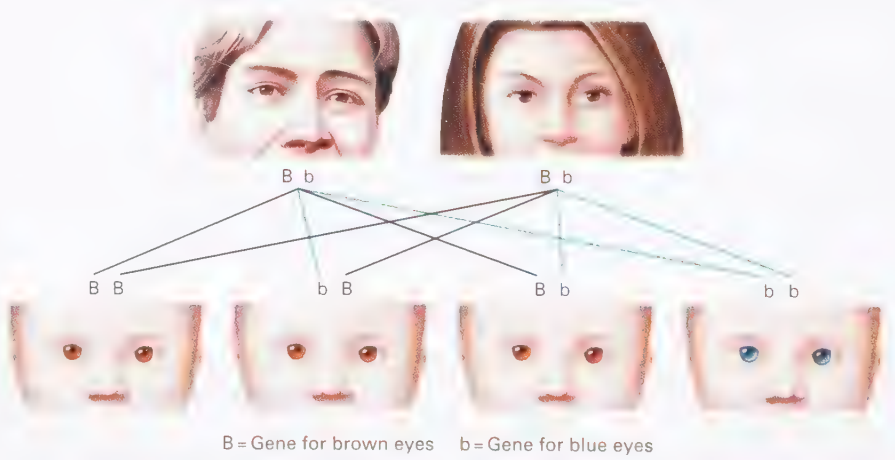


FIGURE 3.3
Changeling? No. If two brown-eyed parents both carry the blue-eye gene, they have one chance in four of having a blue-eyed child. Other recessive genes include the genes for red hair, Rh negative blood, and many genetic diseases.

OBSERVATION QUIZ Why do these four offspring look identical except for eye color? (see answer, page 84)

"Usually have brown eyes" but not always. Sometimes a brown-eyed person is a carrier of the blue-eye gene. In that case, in a blue-eye/brown-eye couple, every child has at least one blue-eye gene (from the blue-eyed parent) and half of them will have a blue-eye recessive gene (from the brown-eyed parent). That half will have blue eyes because they have no dominant brown-eye gene. The other half will have a brown-eye dominant gene and thus have brown eyes but be carriers of the blue-eye gene, like their brown-eyed parent.

This gets tricky if both parents are carriers. Thus if two brown-eyed parents both have the blue-eye recessive gene, the chances are one in four that their child will have blue eyes (see Figure 3.3). This example is simple, because one pair of genes is the main determinant of eye color. However, as with almost every trait, eye color is polygenic, with other genes having some influence. Eyes are various shades of blue and brown, sometimes hazel, sometimes greenish.

TABLE 3.1 The 23rd Pair and X-Linked Color Blindness

23rd Pair	Phenotype	Genotype	Next Generation
1. XX	Normal woman	Not a carrier	No color blindness from mother
2. XY	Normal man	Normal X from mother	No color blindness from father
3. XX	Normal woman	Carrier from father	Half her children will inherit her X. The girls with her X will be carriers; the boys with her X will be color-blind.
4. XX	Normal woman	Carrier from mother	Half her children will inherit her X. The girls with her X will be carriers; the boys with her X will be color-blind.
5. XY	Color-blind man	Inherited from mother	All his daughters will have his X. None of his sons will have his X. All his children will have normal vision, unless their mother also had an X for color blindness.
6. XX	Color-blind woman (rare)	Inherited from both parents	Every child will have one X from her. Therefore, every son will be color-blind. Daughters will be only carriers, unless they also inherit an X from the father, as their mother did.

The crucial fact is that a recessive gene is carried, but not apparent, unless a child happens to inherit the same recessive gene from both parents. Most recessive genes are harmless (like the genes for blue eyes) but some are lethal (like those that cause serious diseases, discussed at the end of this chapter). It is important to understand the double recessive, so parents do not blame each other when their child has a recessive disease, and husbands do not suspect infidelity if his child is unexpectedly blue-eyed or red-haired.

A special case of the dominant–recessive pattern occurs with genes that are **X-linked** (located on the X chromosome). If an X-linked gene is recessive—as are the genes for most forms of color blindness, many allergies, several diseases, and some learning disabilities—the fact that it is on the X chromosome is critical in determining whether it will be expressed in the phenotype (see Table 3.1). Boys will have the trait; girls will usually be carriers.

X-linked A gene carried on the X chromosome. If a male inherits an X-linked recessive trait from his mother, he expresses that trait because the Y from his father has no counteracting gene. Females are more likely to be carriers of X-linked traits but are less likely to express them.

To understand this, remember that the Y chromosome is much smaller than the X, containing far fewer genes. For that reason, genes on the X almost never have a match on the Y. Therefore, recessive traits carried on the X have no dominant gene on the Y.

A boy, XY, with a recessive gene on his X, has no gene on his Y to counteract it, so his phenotype is affected. A girl will be affected only if she has the recessive trait on both her X chromosomes, which is rare. This explains why males with an X-linked disorder inherited it from their mothers, not their fathers. Because of their mothers, 20 times more men than women are color-blind (McIntyre, 2002).

Copy Number Variations

For any living creature, the outcomes of all the interactions involved in heredity are difficult to predict. A small deletion, repetition, or transposition in any of the 3 billion base pairs may be inconsequential, deadly, or something in between.

When the human genome was first mapped in 2001, it was hoped that a specific additive, recessive, or dominant gene could be located for each genetic disorder. Then a cure would soon follow. That "one gene/one disorder" expectation proved to be fantasy, disappointing many doctors who hoped that personalized medicine was imminent (Marshall, 2011). Molecular analysis found, instead, that thousands of seemingly minor variations in base pairs turn out to be influential—

Response for Future Parents (from page 81): Possibly, but you wouldn't want to. You would have to choose one mate for your sons and another for your daughters, and you would have to use sex-selection methods. Even so, it might not work, given all the genes on your genotype. More important, the effort would be unethical, unnatural, and possibly illegal.

each in small ways. Since there are 3 billion base pairs, all the small variations can add up to have a notable impact.

Attention has focused on **copy number variations,** which are genes with repeats (from one to hundreds) or deletions of base pairs. Copy number variations correlate with almost every disease and condition, including heart disease, impaired intellectual abilities, mental illness, and many cancers.

copy number variations Genes with various repeats or deletions of base pairs

We all have copy number variations: There is no person who is completely normal, genetically. One team, looking specifically at genes for neurons in the brain, says "dysfunctions abound . . . with a large number of functional variants in every genome" (Macosko & McCarroll, 2013, p. 564).

Researchers are just beginning to understand the implications of copy number variations, although many hope that soon such genetic information will help target drugs and other medical measures, such as which cocktail of chemotherapy will stop which cancer. Even that may be a hopeful fantasy. Since epigenetics shows that environmental influences can actually change genetic expression, personalized medicine must consider each individual's habits of mind and life at least as much as their genes (Horwitz et al., 2013).

ANSWER TO OBSERVATION QUIZ (from page 82): This is a figure, drawn to illustrate the recessive inheritance of blue eyes, and thus eyes are the only difference shown. If this were a real family, each child would have a distinct appearance.

Especially For Medical Doctors Can you look at a person and then write a prescription that will personalize medicine to their particular genetic susceptibility? (see response, page 86)

To further complicate matters, sometimes one-half of a gene pair switches off completely, allowing the other free rein but potentially causing a problem if that remaining gene has a deleterious variation, recessive or not. For girls, one X of the 23rd pair is deactivated early in prenatal life. The implications of that shutoff are not well understood, but it is known that sometimes that X is from the ovum, sometimes from the sperm. Boys, of course, have only one X, so it always is activated.

Parental Imprinting

X deactivation in girls but not boys is not the only case that is affected by a person's sex. Sometimes the same allele affects male and female embryos differently. It also matters whether a gene came from the mother or the father, a phenomenon called *parental imprinting.*

The best-known example of parental imprinting occurs with a small deletion on chromosome 15. If that deletion came from the father's chromosome 15, the child may develop Prader-Willi syndrome and be obese, slow-moving, and stubborn. If that deletion came from the mother's chromosome 15, the child will have Angelman syndrome and be thin, hyperactive, and happy—sometimes too happy, laugh-



She Laughs Too Much No, not the smiling sister, but the 10-year-old on the right, who has Angelman syndrome. She inherited it from her mother's chromosome 15. Fortunately, her two siblings inherited the mother's other chromosome 15 and are normal. If she had inherited the identical deletion on her father's chromosome 15, she would have developed Prader-Willi syndrome, which would cause her to be overweight as well as always hungry and often angry. With Angelman syndrome, however, laughing, even at someone's pain, is a symptom

MARIA PLATT EVANS SCIENCE SOURCE

ing when no one else does. In both cases, intellectual development is impaired, though in somewhat distinct ways.

Parental imprinting is quite common. Early in prenatal development (day 15), an estimated 553 genes act differently depending on whether they come from the mother or from the father—a much higher number than previously thought (Gregg, 2010). Imprinting may be affected by the sex of the embryo as well as the sex of the parent. For instance, women develop multiple sclerosis more often than men, and they usually inherit it from their mothers, not their fathers, probably for genetic as well as epigenetic reasons (Huynh & Casaccia, 2013).

SUMMING UP The distinction between genotype (heredity) and phenotype (manifest appearance and observed behavior) is one of the many complexities in genetics and human development. All traits are epigenetic, the product of genetic and nongenetic influences, beginning with methylation at conception and continuing lifelong. Furthermore, most traits are polygenic, the result of many genes that interact—some additively and some in a dominant–recessive pattern—with thousands of minor variations in base pairs, many of which may be affected by the sex of the parent and the zygote.

WHAT HAVE YOU LEARNED?

1. Why is a person's genotype not apparent in the phenotype?
2. What is the difference between an epigenetic characteristic and a multifactorial one?
3. What are the main patterns of genetic interaction?
4. Why do polygenic traits suggest that additive genes are more common than dominant–recessive ones?
5. How does parental imprinting affect the genotype and phenotype?

Nature and Nurture

The goal of this chapter is to help every reader grasp the complex interaction between genotype and phenotype. This is not easy. For decades, in many nations, millions of scientists have struggled to understand this complexity. Each year brings advances in statistics and molecular analysis, new data to uncover various patterns, all resulting in hypotheses to be explored.

Now we examine two complex traits: addiction and visual acuity, in two specific manifestations, alcoholism and nearsightedness. As you will see, understanding the progression from genotype to phenotype has many practical implications.

Alcoholism

At various times throughout history, people have considered the abuse of drugs to be a moral weakness, a social scourge, or a personality defect. Historically and internationally, the focus has been on alcohol, since people everywhere discovered fermentation thousands of years ago. Alcohol has been declared illegal (as in the United States from 1919 to 1933) or considered sacred (as in many Judeo-Christian rituals), and people with alcoholism have been jailed, jeered, or even burned at the stake.

We now know that inherited biochemistry affects alcohol metabolism; punishing those with the genes does not stop addiction. There is no single "alcoholic gene," but alleles that make alcoholism more likely have been identified on every chromosome except the Y (Epps & Holt, 2011).


HERO IMAGES INC. /ALAMY

Welcome Home For many women in the United States, white wine is part of the celebration and joy of a house party, as shown here. Most people can drink alcohol harmlessly; there is no sign that these women are problem drinkers. However, danger lurks. Women get drunk on less alcohol than men, and females with alcoholism tend to drink more privately and secretly, often at home, feeling more shame than bravado. All that makes their addiction more difficult to recognize.

To be more specific, genes create an addictive pull that can be overpowering, extremely weak, or somewhere in between, as each person's biochemistry reacts to alcohol by causing sleep, nausea, aggression, joy, relaxation, forgetfulness, sex urges, or tears. Metabolism allows some people to "hold their liquor" and therefore drink too much, whereas others (including many East Asians) sweat and become red-faced after just a few sips, an embarrassing response that may lead to abstinence. This inherited "flushing" tendency not only makes alcohol addiction rare, but it also improves metabolism of alcohol (Kuwahara et al., 2014).

Although the emphasis at first was on the genes that cause biological addiction, we now know that genes that affect personality traits may be pivotal (Macgregor et al., 2009). Temperamental traits known to be inherited, among them a quick temper, sensation-seeking, and high anxiety, all encourage drinking.

Moreover, some contexts (such as fraternity parties) make it hard to avoid alcohol. Other contexts (such as a church social in a "dry" county) make it difficult to swallow anything stronger than lemonade.

Sex (biological—either XX or XY) and gender (cultural) also affect the risk of alcoholism. For biological reasons (body size, fat composition, metabolism), women become drunk on less alcohol than men, and women who are heavy drinkers double their risk of mortality compared to men (Wang et al., 2014).

Many cultures encourage men to drink but not women (Chartier et al., 2014). For example, in Japan, both sexes have the same genes for metabolizing alcohol, yet women drink only about one-tenth as much as men. When women of Japanese ancestry live in the United States, their alcohol consumption increases. Apparently, Americans of Asian decent try to adopt the drinking patterns of their new culture (Makimoto, 1998).

Especially for Drug Counselors Is the wish for excitement likely to lead to addiction? (see response, page 88)

Response for Medical Doctors (from page 84) No. Personalized medicine is the hope of many physicians, but appearance (the phenotype) does not indicate alleles, recessive genes, copy number variations, and other genetic factors that affect drug reactions. Many medical researchers seek to personalize chemotherapy for cancer, but although this is urgently needed, success is still experimental, even when the genotype is known.

Nearsightedness

Age, genes, and culture affect vision as well. The effects of age are easy to notice. Newborns focus only on things within 1 to 3 feet of their eyes; vision improves steadily until about age 10. The eyeball changes shape at puberty, increasing nearsightedness (myopia), and again in middle age, decreasing myopia. The effects of genes and culture on eyesight are more complex, as you will see.

Heritable?

A study of British twins found that the Pax6 gene, which governs eye formation, has many alleles that make people somewhat nearsighted (Hammond et al., 2004). Heritability was almost 90 percent, which means that if one monozygotic twin was nearsighted, the other twin was almost always nearsighted, too.

However, **heritability** indicates only how much of the variation in a particular trait, *within a particular population, and in a particular context and era* can be traced to genes. For example, the heritability of height is very high (about 95 percent) when children receive good medical care and nutrition, but low (about 20 percent) when children are malnourished. Thus, the 90 percent heritability of nearsightedness among the British may not apply elsewhere.

heritability A statistic that indicates what percentage of the variation in a particular trait within a particular population, in a particular context and era, can be traced to genes.

Indeed, it does not. In some African communities, vision heritability is close to zero because severe vitamin A deficiency makes vision depend much more on diet than on genes. If a child has no vitamin A, that child may become blind, even if the genotype is programmed for great vision. Scientists are working to develop a strain of maize (the local staple) that is high in vitamin A. If they succeed, heritability will increase and overall vision will improve (Harjes et al., 2008).

What about children who are well-nourished? Is their vision entirely inherited? Cross-cultural research suggests that it is not (Seppa, 2013).

One report claimed that "myopia is increasing at an 'epidemic' rate, particularly in East Asia" (Park & Congdon, 2004, p. 21). The first published research on this phenomenon appeared in 1992, when scholars noticed that, in army-mandated medical exams of all 17-year-old males in Singapore, 26 percent were nearsighted in 1980 but 43 percent were nearsighted in 1990 (Tay et al., 1992). A recent article in the leading British medical journal suggests that, although genes are to blame for most cases of severe myopia, "any genetic differences may be small" for the common nearsightedness of Asian school children (I. Morgan et al., 2012, p. 1739). Nurture must somehow be involved. But how?

Outdoor Play?

One possible culprit is homework. As Chapter 12 describes, contemporary East Asian children are amazingly proficient in math and science. Fifty years ago, most Asian children were laborers; now almost all are diligent students. As their developing eyes focus on their books, those with a genetic vulnerability to myopia may lose acuity for objects far away—which is exactly what nearsightedness means.

A study of Singaporean 10- to 12-year-olds found a positive correlation between nearsightedness (measured by optometric exams) and high achievement, especially in language proficiency (presumably reflecting more reading). Correlation is not proof, but the odds ratio was 2.5 and the significance was 0.001, which makes this data impossible to ignore (Saw et al., 2007).



LONELY PLANET/GETTY IMAGES

No Time for Play Chinese children spend most of their time in school, at home doing school work, or in school activities, such as this parade in Wan Chai

OBSERVATION QUIZ Focus on education is one reason for China's economic success, but these children wear one of the negative consequences. (see answer, page 89)

Data from the United States on children playing sports has led some ophthalmologists to suggest that the underlying cause of myopia among Americans is too little exposure to daylight (I. Morgan et al., 2012). Perhaps if children spent more time outside playing, fewer would need glasses.

Between the early 1970s and the early 2000s, nearsightedness in the U.S. population increased from 25 to 42 percent (Vitale et al., 2009). Urbanization, television, and fear of strangers have kept many U.S. children indoors most of the time, unlike children of earlier generations who played outside for hours each day. One

Response for Drug Counselors (from page 86): Maybe. Some people who love risk become addicts; others develop a healthy lifestyle that includes adventure, new people, and exotic places. Any trait can lead in various directions. You need to be aware of the connections so that you can steer your clients toward healthy adventures.

ophthalmologist comments that "we're kind of a dim indoors people nowadays" (Mutti quoted in Holden, 2010, p. 17). Formerly, genetically vulnerable children did not necessarily become nearsighted; now they do.

Practical Applications

Since genes affect every disorder, no one should be blamed or punished for inherited problems. However, knowing that genes never act in isolation allows prevention after birth. For instance, if alcoholism is in the genes, parents can keep alcohol out of their home, hoping their children become cognitively and socially mature before imbibing. If nearsightedness runs in the family, parents can play outdoors with their children every day.

Of course, outdoor play and abstention from alcohol are recommended for all children, as are dozens of other behaviors, such as flossing, saying "please," getting enough sleep, eating vegetables, and writing thank-you notes. No parent can enforce every recommendation, but awareness of genetic risks can guide priorities.



a case to study

Mickey Mantle

Ignoring the nature–nurture interaction can be lethal. Consider baseball superstar Mickey Mantle, who hit more home runs in World Series baseball (18) than any other player before or since. Most of his male relatives suffered from alcoholism and died before middle age, including his father, who died of Hodgkin disease (a form of cancer) at age 39. Mantle became "a notorious alcoholic [because he] believed a family history of early mortality meant he would die young" (Jaffe, 2004, p. 37). He ignored his genetic predisposition to alcoholism.

At age 46, Mantle said, "If I knew I was going to live this long, I would have taken better care of myself." He never developed Hodgkin disease, and if he had, chemotherapy that was discovered and developed since his father's death would likely have saved him —an example of environment prevailing over genes.

However, drinking destroyed Mantle's liver. He understood too late what he had done. When he was dying, he told his fans at Yankee Stadium: "Please don't do drugs and alcohol. God gave us only one body, keep it healthy. If you want to do something great, be an organ donor" (quoted in Begos, 2010). Despite a last-minute liver transplant, he died at age 63—15 years younger than most men of his time.

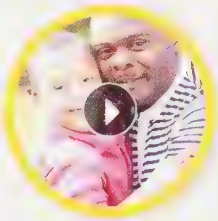
SUMMING UP Genes affect every trait—whether it is something wonderful, such as a wacky sense of humor; something fearful, such as a violent temper; or something quite ordinary, such as a tendency to be bored. The environment affects every trait as well, in ways that change as maturational, cultural, and historical processes unfold. Genes themselves can be modified through epigenetic factors, not only biological ones but also psychological ones. This is apparent in height, alcoholism, nearsightedness, and almost every other physical and psychological condition. All have genetic roots, developmental patterns, and environmental triggers.

WHAT HAVE YOU LEARNED?

1. Regarding heritability, why is it important to know which population at what historical time provided the data?
2. What nature and nurture reasons make one person develop alcoholism and another not?

3. What nature and nurture reasons make one person nearsighted and another not?
4. What is the practical application resulting from understanding the relationship between nature and nurture?

Video: Genetic Disorders
http://qrs.ly/pg4eoxw



MONKEY BUSINESS IMAGES/SHUTTERSTOCK

Chromosomal and Genetic Problems

We now focus on conditions caused by an extra chromosome or a single destructive gene. Three factors make these conditions relevant to human development:

1. They provide insight into the complexities of nature and nurture.
2. Knowing their origins helps limit their effects.
3. Information combats prejudice: Difference is not always deficit.

Not Exactly 46

As you know, each sperm or ovum usually has 23 chromosomes, creating a zygote with 46 chromosomes and eventually a person. However, cells do not always split exactly in half to make those reproductive cells.

One variable known to correlate with chromosomal abnormalities is the parents' age, particularly the age of the mother. A suggested explanation is that, since ova begin to form before a girl is born, older mothers have older ova. When the 46 chromosomes of the mother make ova, usually the split is even, 23/23. But older women are more likely to have some ova that have 22 or 24 chromosomes. Sperm also are diminished in quantity and normality as men age.

Miscounts are not rare. One estimate is that 5 to 10 percent of all zygotes have more or fewer than 46 chromosomes (Brooker, 2009); another estimate suggests that the rate is as high as 50 percent (Fragouli & Wells, 2011). Estimates vary because no one knows for certain. Almost all abnormal zygotes fail to duplicate, divide, differentiate, and implant, or are spontaneously aborted before a woman even knows she is pregnant. Thus an accurate count of zygotes with extra chromosomes is impossible to obtain.

If implantation does occur, many zygotes with chromosomal miscounts are aborted, either spontaneously (miscarried) or by choice. It is estimated that the abortion rate for such zygotes is about 5 percent. Ninety-nine percent of newborns have the usual 46 chromosomes, but for those who do not, birth is hazardous.

About 5 percent of stillborn (dead at birth) babies have 47 chromosomes (Miller & Therman, 2001), and many other babies with 47 chromosomes die within the first few days. Only once in about every 200 births does a newborn survive with 45, 47, or, rarely, 48 or 49 chromosomes.

Survival is much more common if some of the cells have 46 chromosomes and some 47, a condition called *mosaicism*, or if the problem does not involve a whole chromosome but only a missing or extra piece of a chromosome. Overall, advanced analysis suggests mosaicism "may represent the rule rather than the exception" (Lupski, 2013, p. 358). We may all be mosaics, some more than others. Usually this has no detectable effect on development, although it seems as if cancer is more likely if a person has extra or missing genetic material.

Down Syndrome

If an entire chromosome is missing or added, that leads to a recognizable *syndrome*, a cluster of distinct characteristics that tend to occur together. Usually the cause is three chromosomes at a particular location instead of the usual two (a condition called a *trisomy*). The most common extra-chromosome condition that

// ANSWER TO OBSERVATION QUIZ
(from page 87): Not the boy/girl uniforms, which some research says may increase attention, but three of the four have glasses. Did the lad in front forget his?

Down syndrome A condition in which a person has 47 chromosomes instead of the usual 46, with 3 rather than 2 chromosomes at the 21st site. People with Down syndrome typically have distinctive characteristics, including unusual facial features, heart abnormalities, and language difficulties. (Also called *trisomy-21*.)

results in a surviving child is **Down syndrome,** also called *trisomy-21* because the person has three copies of chromosome 21.

Some 300 distinct characteristics can result from that third chromosome 21. No individual with Down syndrome is identical to another, but trisomy-21 usually produces specific physical characteristics—a thick tongue, round face, and slanted eyes as well as distinctive hands, feet, and fingerprints.

Many people with Down syndrome also have hearing problems, heart abnormalities, muscle weakness, and short stature. They are usually slower to develop intellectually, especially in language, and they reach their maximum intellectual potential at about age 15 (Rondal, 2010). Some are severely intellectually disabled; others are of average or above-average intelligence. That extra chromosome affects the person lifelong, but family context, educational efforts, and possibly medication can decrease the harm (Kuehn, 2011).

Universal Happiness All young children delight in painting brightly colored pictures on a big canvas, but this scene is unusual for two reasons: Daniel has trisomy-21, and this photograph was taken at the only school in Chile where normal and special-needs children share classrooms

OBSERVATION QUIZ How many characteristics can you see that indicate that Daniel has Down syndrome? (see answer, page 92)



Problems of the 23rd Pair

Every human has at least 44 autosomes and one X chromosome; an embryo cannot develop without those 45. However, about 1 in every 500 infants is born with only one sex chromosome (no Y) or with three or more (not just two) (Hamerton & Evans, 2005); the particular combination of sex chromosomes results in specific syndromes (see Table 3.2).

TABLE 3.2 Common Abnormalities Involving the Sex Chromosomes

Chromosomal Pattern	Physical Appearance	Psychological Characteristics	Incidence*
XXY (Klinefelter Syndrome)	Male. Usual male characteristics at puberty do not develop—penis does not grow, voice does not deepen. Usually sterile. Breasts may develop.	Can have some learning disabilities, especially in language skills.	1 in 700 males
XYY (Jacob's Syndrome)	Male. Typically tall.	Risk of intellectual impairment, especially in language skills	1 in 1,000 males
XXX (Triple X Syndrome)	Female. Normal Appearance.	Impaired in most intellectual skills.	1 in 500 females
XO (only one sex chromosome) (Turner Syndrome)	Female. Short, often "webbed," neck. Secondary sex characteristics (breasts, menstruation) do not develop.	Some learning disabilities, especially related to math and spatial understanding; difficulty recognizing facial expressions of emotion.	1 in 2,000 females

*Incidence is approximate at birth

Source Hamerton & Evans, 2005; Aksglaede et al., 2013; Powell, 2013

Having an odd number of sex chromosomes impairs cognition and sexual maturation, with varied specifics depending on epigenetics (Hong & Reiss, 2014). It is not unusual for an affected person to seem to be developing normally until they find they are infertile. Then diagnosis reveals the undetected problem.

Especially for Teachers Suppose you know that one of your students has a sibling who has Down syndrome. What special actions should you take? (see response, page 93)

Gene Disorders

Everyone carries alleles that *could* produce serious diseases or handicaps in the next generation. Most such genes have no serious consequences because they are recessive. The phenotype is affected only when the inherited gene is dominant or when a zygote is homozygous for a particular recessive condition, that is, when the zygote has received the recessive gene from both parents.

Especially for Future Doctors Might a patient who is worried about his or her sexuality have an undiagnosed abnormality of the sex chromosome? (see response, page 93)

Dominant Disorders

Most of the 7,000 *known* single-gene disorders are dominant (always expressed) (Milunsky, 2011). Severe dominant disorders are rare because people with such disorders usually die in childhood and thus do not pass the gene on to children.

Severe dominant disorders become common only when they are latent in childhood, manifest in adulthood. That is the case with *Huntington disease*, a fatal central nervous system disorder caused by a copy number variation—more than 35 repetitions of a particular set of three base pairs. The symptoms first appear in middle age, when some people have had several children, as did the original Mr. Huntington. Half of them inherited his dominant gene, which is why the disease is named after him.

Another exception to the general rule that serious dominant diseases are not inherited is a rare but severe form of Alzheimer's disease. It causes dementia before age 60. Most forms of Alzheimer's, which begin after age 70, are not dominant.

Recessive Disorders

Severe recessive diseases are more numerous because they are passed down from one generation to the next by carriers who do not know they carry the recessive gene. Some such recessive conditions are X-linked, including hemophilia and Duchenne muscular dystrophy.

Fragile X syndrome is caused by more than 200 repetitions on one gene (Plomin et al., 2013). (Some repetitions are normal, but not this many.) The cognitive deficits caused by fragile X syndrome are the most common form of *inherited* intellectual disability (many other forms, such as trisomy-21, are not usually inherited). Boys are much more often impaired by fragile X than are girls.

fragile X syndrome A genetic disorder in which part of the X chromosome seems to be attached to the rest of it by a very thin string of molecules. The cause is a single gene that has more than 200 repetitions of one triplet.

Most recessive disorders are on the autosomes, not the X or Y (Milunsky, 2011). Carrier detection is possible for about 500 of them, and diagnosis of the actual disorder is possible for thousands of them, creating an ethical dilemma. Should someone be told about a genetic disorder if no treatment is available and if the knowledge will not change anything?

The Most Common Disorders

Some recessive diseases are very common, and that has led to research and effective treatment. About 1 in 12 North American men and women carries an allele for cystic fibrosis, thalassemia, or sickle-cell disease, all devastating in children of both sexes. That high incidence occurs because carriers have benefited from the gene, although the double recessive is harmful.

ANSWER TO OBSERVATION QUIZ
(from page 90) Individuals with Down syndrome vary in many traits, but visible here are five common ones. Compared to most children his age, including his classmate beside him, Daniel has a rounder face, narrower eyes, shorter stature, larger teeth and tongue, and—best of all—a happier temperament

To explain this benefit, consider the most studied example: sickle-cell anemia. Carriers of the sickle-cell gene die less often from malaria, which is prevalent in parts of Africa. Indeed, four distinct alleles cause sickle-cell anemia, each originating in a malaria-prone region.

Selective adaptation allowed the gene to become widespread because it protected more people (the carriers) than it killed (those who inherited the recessive gene from both parents). Odds were that if a couple were both carriers and had four children, one would die of sickle cell, one would not be a carrier and thus might die of malaria, but two would be carriers. These carriers would not only develop normally but they would also have added protection against a common, fatal disease, and thus they would be likely to become parents themselves. In that way, the recessive trait became widespread.

Almost every disease and risk of death is more common in one ethnic group than in another (Weiss & Koepsell, 2014). About 11 percent of Americans with African ancestors are carriers of the sickle-cell gene; cystic fibrosis is more common among Americans with ancestors from northern Europe because carriers may have been protected from cholera. Dark skin is protective against skin cancer, and light skin allows more vitamin D to be absorbed from the sun—a benefit if a baby lives where sunlight is scarce.

Furthermore, almost every infectious disease is more or less common because of particular alleles (McLaren et al., 2013). For example, an allele provides protection against HIV. That allele is not yet common because, unlike malaria and cholera, HIV has become widespread only in the past decades. However, many scientists are working to artificially provide exactly the chemical protection that a few people have naturally.

LaunchPad



Video: Genetic Testing explores the pros and cons of knowing what diseases may eventually harm us or our unborn children.

Genetic Counseling and Testing

Until recently, after the birth of a child with a severe disorder, couples blamed witches or fate, not genes or chromosomes. That has changed, with many young adults concerned about their genes long before parenthood. Virtually everyone has a relative with a serious condition and wonders what their children will inherit. People are also curious about their own future health. Many pay for commercial genetic testing, which often provides misleading information.

Psychological Disorders

Misinformation and mistaken fears are particularly destructive for psychological disorders, such as depression, schizophrenia, and autism. No doubt genes are a factor in all of these conditions (Plomin et al., 2013). Yet, as with addiction and vision, the environment is crucial for every disorder—not only what the parents do but also what the community and governments do.

This was confirmed by a study of the entire population of Denmark, where good medical records and decades of free public health allow accurate research on mental health. If both Danish parents developed schizophrenia, 27 percent of their children developed it; if one parent had it, 7 percent of their children developed it. These same statistics can be presented another way: Even if both parents developed the disease, almost three-fourths (73 percent) of their children never did (Gottesman et al., 2010). (Some of them developed other psychological disorders, again providing evidence for epigenetics.)

Even more persuasive is evidence pertaining to monozygotic twins. If one identical twin develops schizophrenia, often—but not always—the other twin also develops a psychological disorder. Obviously, genes are powerful, but also obviously,

schizophrenia is not entirely genetic. Epigenetics, and prenatal and childhood experiences, are crucial.

Numerous studies have identified environmental influences on schizophrenia, including fetal malnutrition, birth in the summer, adolescent use of psychoactive drugs, emigration in young adulthood, and family emotionality during adulthood. Because environment is crucial, few scientists advocate genetic testing for schizophrenia or any mental condition. They fear that a positive test would lead to depression and stress, factors that might cause a disorder that would not have appeared without the test. Further, a positive genetic diagnosis might add to the prejudice against people who become mentally ill (Mitchell et al., 2010).

The Need for Counseling

The problems with testing for genes that cause mental disorders are only one of several complications that might emerge from a societal uptick in genetic testing. Scientists—and the general public—have many opinions about genetic testing, and nations have varying policies (Plows, 2011).

One complication is that science has revealed much more than anyone imagined a decade ago. Laws and ethics have not kept up with the possibilities, and very few prospective parents can interpret their own genetic history or laboratory results without help. Some seek abortion or sterilization without needing such a drastic step; others blithely give birth to one impaired child after another.

Professionals trained to provide **genetic counseling** help prospective parents understand their genetic risk so that they can make informed decisions. The genetic counselor's task is complicated, for many reasons. One is that testing is now possible for hundreds of conditions, but it is not always accurate.

Moreover, a particular gene might increase the risk of a problem by only a tiny amount, perhaps 0.1 percent. Further, every adult is a carrier for something. It is crucial to explain test results carefully, since many people misinterpret words such as *risks* and *probability*, especially when considering personal and emotionally charged information (O'Doherty, 2006).

Response for Teachers (from page 91) As the text says, "information combats prejudice." Your first step would be to read about Down syndrome. You would learn, among other things, that it is not usually inherited (your student need not worry about his or her progeny) and that some children with Down syndrome need extra medical and educational attention. You might need to pay special attention to your student, whose parents might focus on the sibling.

Response for Future Doctors (from page 91): That is highly unlikely. Chromosomal abnormalities are evident long before adulthood. It is quite normal for adults to be worried about sexuality for social, not biological, reasons. You could test the karyotype, but that may be needlessly alarmist.

genetic counseling Consultation and testing by trained experts that enables individuals to learn about their genetic heritage, including harmful conditions that they might pass along to any children they may conceive.



NATHAN MORGAN/THE NEW YORK TIMES/REDUX

Who Has the Fatal Dominant Disease? The mother, but not the children. Unless a cure is found, Amanda Kalinsky will grow weak and suffer from dementia, dying before age 60. She and her husband, Bradley, wanted children without Amanda's dominant gene for a rare disorder, Gerstmann-Straussler-Scheinker disease. Accordingly, they used IVF and pre-implantation testing. Only zygotes without the dominant gene were implanted. This photo shows the happy result

Even doctors do not always understand genetics. Consider the experience of one of my students. A month before she became pregnant, Jeannette was required to have a rubella vaccination for her job. Hearing that she had had the shot, her prenatal care doctor gave her the following prognosis:

> My baby would be born with many defects, his ears would not be normal, he would be intellectually disabled. . . . I went home and cried for hours and hours. . . .
>
> I finally went to see a genetic counselor. Everything was fine, thank the Lord, thank you, my beautiful baby is okay.
>
> *[Jeannette, personal communication]*

It is possible that Jeannette misunderstood what she was told, but that is exactly why the doctor should not have spoken. Genetic counselors are trained to make information clear. If sensitive counseling is available, then preconception, prenatal, or even prenuptial (before marriage) testing is especially useful for:

- individuals who have a parent, sibling, or child with a serious genetic condition
- couples who have had several spontaneous abortions or stillbirths
- couples who are infertile
- couples from the same ethnic group, particularly if they are relatives
- women over age 35 and men over age 40

Genetic counselors follow two ethical rules: (1) tests are confidential, beyond the reach of insurance companies and public records, and (2) decisions are made by the clients, not by the counselors.

However, these guidelines are not always easy to follow (Parker, 2012). One quandary arises when parents already have a child with a recessive disease, but tests reveal that the husband does not carry that gene. Should the counselor tell the couple that their next child will not have this disease because the husband is not the biological father of the first?

Another quandary arises when DNA is collected for one purpose—say, to assess the risk of sickle-cell disease—and analysis reveals another quite different problem, such as an extra sex chromosome or a high risk of breast cancer. This problem is new: Even a few years ago, testing was so expensive that research did not discover any conditions except those for which they were testing. Now, because of genome sequencing, many counselors learn about thousands of conditions that were not suspected and are not treatable (Kaiser, 2013). Must they inform the person? Must they tell blood relatives?

The current consensus is that information should be shared if:

1. the person wants to hear it
2. the risk is severe and verified
3. an experienced counselor explains the data
4. treatment is available (Couzin-Frankel, 2011)

But not everyone accepts that consensus. Scientists and physicians disagree about severity, certainty, and treatment. A group of experts recently advocated informing patients of any serious genetic disorder, even when the person does not want to know, and when the information might be harmful (Couzin-Frankel, 2013).

An added complication is that individuals differ in their willingness to hear bad news. What if one person wants to know, but other family members—perhaps a parent or a monozygotic twin who has the same condition—do not. We all are carriers. Do we all want to know of what?

Sometimes couples make a decision (such as to begin or to abort a pregnancy) that reflects a mistaken calculation of the risk, at least as the professional interprets it (Parker, 2012). Even with careful counseling, people with identical genetic conditions often make opposite choices.

For instance, 108 women who already had one child with fragile X syndrome were told they had a 50 percent chance of having another such child. Most (77 percent) decided to avoid pregnancy with sterilization or excellent contraception, but some (20 percent) deliberately had another child (Raspberry & Skinner, 2011). Always the professional explains facts and probabilities; always the clients decide.

Many developmentalists stress that changes in the environment, not in the genes, are more likely to improve health. In fact, some believe that the twenty-first-century emphasis on genes is a way to avoid focusing on poverty, pollution, pesticides, and so on, even though such factors cause more health problems than genes do (Plows, 2011). Instead of genetic counseling, should we advocate health counseling?



Reach for the Sky Gavin and Jake Barker both have cystic fibrosis, which would have meant early death had they been born 50 years ago. Now their parents pound on their chests twice a day to loosen phlegm—and they can enjoy jumping on the trampoline while wearing special pneumatic vests under their shirts

As you have read many times in this chapter, genes are part of the human story, influencing every page, but they do not determine the plot or the final paragraph. The remaining chapters describe the rest of the story.

SUMMING UP Often a zygote does not have 46 chromosomes. Such zygotes rarely develop to birth. Two primary exceptions are those with Down syndrome (trisomy-21) and those with abnormalities of the sex chromosomes.

Every person is a carrier for some serious genetic conditions. Most of these conditions are rare and polygenetic. A few recessive-gene diseases, such as sickle-cell disease, are comparatively common because the recessive gene protected against some common lethal conditions, and thus carriers were likely to survive. Serious dominant diseases are rare because the affected person has no children. However, a few dominant conditions, such as Huntington's, continue because their effects are not evident until middle adulthood. Most inherited psychological conditions are additive and multifactorial, thus difficult to predict. .

For all chromosomal and genetic problems, counseling helps couples clarify their values and understand probabilities and consequences. However, the decision to conceive or abort involves personal and ethical values, so the final decision is made by those directly involved.

WHAT HAVE YOU LEARNED?

1. Why does this textbook on normal development include abnormal development?
2. What usually happens when a zygote has fewer or more than 46 chromosomes?
3. What are the consequences if a baby is born with trisomy-21?
4. Why are a few recessive traits (such as sickle-cell) quite common?
5. Why are relatively few genetic conditions dominant?
6. Why do people need counselors, not merely fact sheets about genetic conditions?

SUMMARY

The Genetic Code

1. Genes are the foundation for all development, first instructing the living creature to form the body and brain and then influencing thought and behavior. Human conception occurs when two gametes (an ovum and a sperm, each with 23 chromosomes) combine to form a zygote, 46 chromosomes in a single cell.
2. Genes and chromosomes from each parent match up to make the zygote. The match is not always perfect because of genetic variations called alleles.
3. The sex of an embryo depends on the sperm: A Y sperm creates an XY (male) embryo; an X sperm creates an XX (female) embryo. Virtually every cell of every living creature has the unique genetic code of the zygote that began that life. The human genome contains about 20,000 genes in all.

New Cells, New Functions

4. Early duplication of the original one-celled zygote creates stem cells, each of which could become a person. Soon differentiation occurs, and cells develop into the placenta or part of the developing body.
5. Twins occur if a zygote splits into two separate beings (monozygotic, or identical, twins) or if two ova are fertilized in the same cycle by two sperm (dizygotic, or fraternal, twins).
6. Monozygotic multiples are genetically the same. Dizygotic multiples have only half of their genes in common, as do all siblings who have the same parents.
7. Assisted reproductive technology (ART), including drugs and in vitro fertilization (IVF), has led not only to millions of much-wanted babies but also to an increase in multiple births, who have a higher rate of medical problems. Several aspects of ART raise ethical and medical questions.

From Genotype to Phenotype

8. Genes interact in various ways—sometimes additively, with each gene contributing to development, and sometimes in a dominant–recessive pattern. Environmental factors influence the phenotype as well. Epigenetics is the study of all the environmental factors that affect the expression of genes, beginning at conception.
9. The environment interacts with the genetic instructions for every trait. Almost every aspect of a person is multifactorial and polygenic.
10. The first few divisions of a zygote are stem cells, capable of becoming any part of a person. Then cells differentiate, specializing in a particular function.
11. Combinations of chromosomes, interactions among genes, and myriad influences from the environment all ensure both similarity and diversity within and between species. This aids health and survival.

Nature and Nurture

12. Environmental influences are crucial for almost every complex trait, with each person experiencing different environments. Customs and contexts differ markedly.
13. Genetic makeup can make a person susceptible to a variety of conditions; nongenetic factors also affect susceptibility. Examples include alcoholism and nearsightedness. Cultural and familial differences affecting both of these problems are dramatic evidence for the role of nurture.
14. Knowing the impact of genes and the environment can be helpful. People are less likely to blame someone for a characteristic that is inherited; realizing that a child is at risk of a serious condition may help with prevention.

Chromosomal and Genetic Problems

15. Often a gamete has fewer or more than 23 chromosomes. Usually such zygotes do not implant, grow, or survive.
16. Infants may survive if they have three chromosomes at the 21st location (Down syndrome, or trisomy-21) or one, three, or more sex chromosomes instead of two. Affected individuals have lifelong physical and cognitive impairment but can live a nearly normal life.
17. Everyone is a carrier for genetic abnormalities. Genetic disorders are usually recessive (not affecting the phenotype unless inherited from both parents). If a disorder is dominant, the trait is usually mild, varied, or inconsequential until middle adulthood.
18. Genetic testing and counseling can help many couples. Testing usually provides information about possibilities, not actualities. Couples, counselors, and cultures differ in the decisions they make when risks are known.

KEY TERMS

gamete (p. 68)
zygote (p. 68)
deoxyribonucleic acid (DNA) (p. 68)
chromosome (p. 68)
gene (p. 68)
allele (p. 68)
epigenetic (p.69)
genome (p. 70)
genotype (p. 70)
homozygous (p. 70)
heterozygous (p. 71)
23rd pair (p. 71)
XY (p. 71)
XX (p. 71)
stem cells (p. 74)
monozygotic (MN) twins (p. 75)
dizygotic (DZ) twins (p. 75)
assisted reproductive technology (ART) (p. 78)
in vitro fertilization (IVF) (p. 78)
intra-cytoplasmic sperm injection (ICSI) (p. 78)
phenotype (p. 79)
polygenic (p. 80)
multifactorial (p. 80)
Human Genome Project (p. 81)
dominant-recessive pattern (p. 82)
carrier (p. 82)
X-linked (p. 83)
copy number variations (p. 84)
heritability (p. 87)
Down syndrome (p. 90)
fragile X syndrome (p. 91)
genetic counseling (p. 93)

APPLICATIONS

1. Pick one of your traits, and explain the influences that both nature *and* nurture have on it. For example, if you have a short temper, explain its origins in your genetics, your culture, and your childhood experiences.
2. Many adults have a preference for having a son or a daughter. Interview adults of several ages and backgrounds about their preferences. If they give the socially preferable answer ("It does not matter"), ask how they think the two sexes differ. Listen and take notes—don't debate. Analyze the implications of the responses you get.
3. Draw a genetic chart of your biological relatives, going back as many generations as you can, listing all serious illnesses and causes of death. Include ancestors who died in infancy. Do you see any genetic susceptibility? If so, how can you overcome it?
4. List a dozen people you know who need glasses (or other corrective lenses) and a dozen who do not. Are there any patterns? Is this correlation or causation?



CHAPTER 4

Prenatal Development and Birth



1. When do the most important parts of the fetus form?
2. Does medical assistance safeguard or impede the birth process?
3. Why do substances and circumstances sometimes harm the fetus and sometimes have no impact?
4. If tiny newborns survive, are they still affected by low birthweight years later?
5. Why do some mothers suffer from postpartum depression, and how does that affect the baby?

- Prenatal Development
  - Germinal: The First 14 Days
  - Embryo: From the Third Through the Eighth Week
  - Fetus: From the Ninth Week Until Birth
- Birth
  - The Newborn's First Minutes
  - Medical Assistance
- Harm to the Fetus
  - Harmful Substances
  - Applying the Research
  - A VIEW FROM SCIENCE: Conflicting Advice
  - Prenatal Care
  - OPPOSING PERSPECTIVES: "What Do People Live to Do?"
  - Complications During Birth
- Low Birthweight: Causes and Consequences
  - Mothers and Small Babies
  - What About the Father?
  - Consequences of Low Birthweight
  - Comparing Nations
- The New Family
  - The Newborn
  - New Mothers
  - New Fathers
  - Parental Alliance
  - Family Bonding

The scientific study of human development is not only about how individuals change over time, it is about how contexts and cultures change over time. Historical change—Bronfenbrenner's chronosystem—is dramatically apparent in prenatal development and childbirth. If your knowledge of these comes from a high school biology class, or from your mother's experience with you, get ready for surprises.

My daughter Elissa recently had her second child. She and her husband were together with the midwife in the labor room of the Birthing Center; I was with Asa, age 5, in the family room. Periodically Asa ran down the hall to see his parents. Usually the midwife let us come in, and Elissa smiled and asked him how he was doing. Sometimes we had to wait for a minute. Then, contraction over, mother and son smiled at each other again.

When the baby was born, the nurse came to tell us, "There's a new person who wants to meet you." Asa said, "Let me put this last Lego piece in." He did, and brought his new creation to show his parents, who introduced him to his brother, sucking on his mother's breast. Six hours later, the whole family was home.

The contrast between this 2014 birth and Elissa's own arrival is stark. Back then, midwives were banned from my New York City hospital. Fathers were relegated to waiting rooms, as my husband, Martin, had been for our first two babies. Newly empowered by feminism, I convinced my board-certified obstetrician to let Martin witness birth. He wept when he held her, wet and wide-eyed, moments old. Then she was wiped, weighed, wrapped, and wheeled away. The nurses did not let me hold my daughter until she was 24 hours old. They said that I had no milk, that I needed rest, that my baby was tired, too. Wrong, wrong, wrong.

On day two, Martin brought our older children to visit. They were not permitted on the maternity floor, so they could not view their sister through the nursery glass. But I

could hobble down to a special room to greet them. That was an innovation. Formerly no visitors under age 12 could set foot in the hospital.

On day three, I was breast-feeding and talking on the phone when an aide came to take Elissa back to the nursery. She scolded me.

"Hang up that phone. When you nurse, you must give your baby undivided attention."

Wrong. She was old-fashioned; I knew better. I had nursed Bethany and Rachel while setting the table, stirring a pot, turning pages, and, of course, holding a phone. I was a pioneer, unlike that aide. I was riding the wave of liberation that was moving millions of women forward toward a brighter, fairer, unisex future.

Now I am the old-fashioned one. My daughter and her husband made dozens of decisions about this pregnancy and birth that I never imagined possible.

This chapter describes what we now know about prenatal growth and birth, and some of the vast differences from one era, one culture, even one family to another. Possible harm is noted: causes and consequences of diseases, malnutrition, drugs, pollution, stress, and so on, from the earliest days of life. Fathers, particularly, have become more active partners, while all of us—medical professionals, governments, and family members—affect the early life of each developing person. This chapter will help us do our part.

germinal period The first two weeks of prenatal development after conception, characterized by rapid cell division and the beginning of cell differentiation.

embryonic period The stage of prenatal development from approximately the third through the eighth week after conception, during which the basic forms of all body structures, including internal organs, develop.

fetal period The stage of prenatal development from the ninth week after conception until birth, during which the fetus gains about 7 pounds (more than 3,000 grams) and organs become more mature, gradually able to function on their own.

Prenatal Development

The most dramatic and extensive transformation of life occurs before birth. To make it easier to study, prenatal development is often divided into three main periods. The first two weeks are called the **germinal period;** the third through the eighth week is the **embryonic period;** from then until birth is the **fetal period.** (Alternative terms are presented in Table 4.1.)

TABLE 4.1 Timing and Terminology

Popular and professional books use various phrases to segment the stages of pregnancy. The following comments may help to clarify the phrases used.

- *Beginning of pregnancy:* Pregnancy begins at conception, which is also the starting point of *gestational age.* However, the organism does not become an embryo until about two weeks later, and pregnancy does not affect the woman (and is not confirmed by blood or urine testing) until implantation. Perhaps because the exact date of conception is usually unknown, some obstetricians and publications count from the woman's last menstrual period (LMP), usually about 14 days *before* conception.
- *Length of pregnancy:* Full-term pregnancies last 266 days, or 38 weeks, or 9 months. If the LMP is used as the starting time, pregnancy lasts 40 weeks, sometimes expressed as 10 lunar months. (A lunar month is 28 days long.)
- *Trimesters:* Instead of *germinal period, embryonic period,* and *fetal period,* as used in this text, some writers divide pregnancy into three-month periods called *trimesters.* Months 1, 2, and 3 are called the *first trimester,* months 4, 5, and 6 the *second trimester,* and months 7, 8, and 9, the *third trimester.*
- *Due date:* Although a specific due date based on the LMP is calculated, only 5 percent of babies are born on that exact day. Babies born between two weeks before and one week after that date are considered *full term.* (This is recent; until 2012, three weeks before and two weeks after were considered full term.) Because of increased risks for post-mature babies, labor is often induced if the baby has not arrived within 7 days after the due date, although many midwives and doctors prefer to wait to see if labor begins spontaneously.

Germinal: The First 14 Days

You learned in Chapter 3 that the one-celled zygote duplicates, divides, and multiplies. Soon after the 16-cell stage, differentiation begins as those early cells take on distinct characteristics and gravitate toward particular locations.

About a week after conception, the cell mass, now called a *blastocyst*, forms two distinct parts—a shell that will become the *placenta* and a nucleus that will become the embryo.

The first task of the outer cells is to achieve **implantation**—that is, to embed themselves in the nurturing lining of the uterus (see Figure 4.1). This process is far from automatic; about half of natural conceptions and an even larger proportion of in vitro conceptions never implant (see Table 4.2). Most new life ends before an embryo begins (Sadler, 2012).

implantation The process, beginning about 10 days after conception, in which the developing organism burrows into the placenta that lines the uterus, where it can be nourished and protected as it continues to develop.

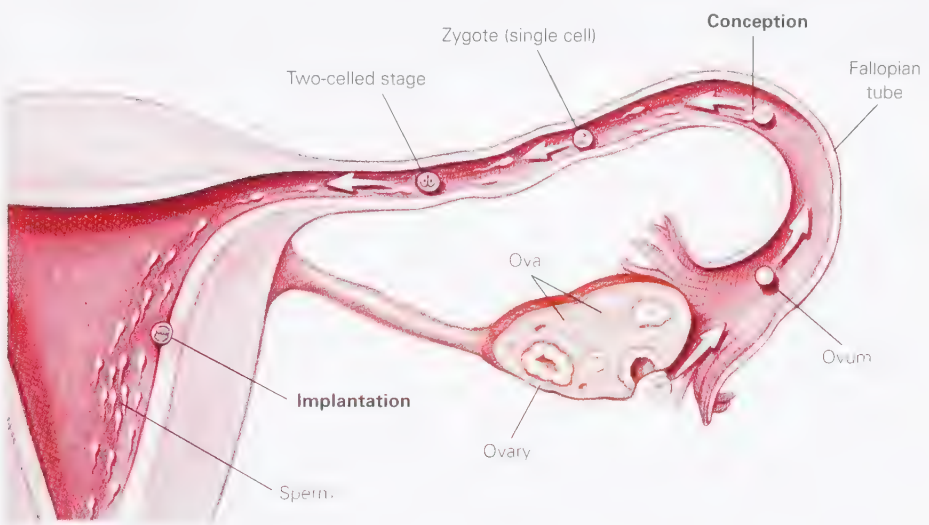


FIGURE 4.1
The Most Dangerous Journey In the first 10 days after conception, the organism does not increase in size because it is not yet nourished by the mother. However, the number of cells increases rapidly as the organism prepares for implantation, which occurs successfully not quite half of the time.

Table 4.2 Vulnerability During Prenatal Development

The Germinal Period

An estimated 60 percent of all zygotes do not grow or implant properly and thus do not survive the germinal period. Many of these organisms are abnormal; few women realize they were pregnant.

The Embryonic Period

About 20 percent of all embryos are aborted spontaneously. This is usually called an early *miscarriage*, a term that implies something wrong with the woman, when in fact the most common reason for a spontaneous abortion is a chromosomal abnormality.

The Fetal Period

About 5 percent of all fetuses are aborted spontaneously before viability at 22 weeks or are *stillborn*, defined as born dead after 22 weeks. This is much more common in poor nations.

Birth

Because of all these factors, only about 31 percent of all zygotes grow and survive to become living newborn babies. Age of the mother is crucial. One estimate is that less than 3 percent of all conceptions after age 40 result in live births.

Sources: Bentley & Mascie-Taylor, 2000; Corda et al., 2012; Laurino et al., 2005



(a)



(b)

The Embryonic Period (*a*) At 4 weeks past conception, the embryo is only about 1/8 inch (3 millimeters) long, but already the head has taken shape. (*b*) By 7 weeks, the organism is somewhat less than an inch (2 centimeters) long. Eyes, nose, the digestive system, and even the first stage of toe formation can be seen.

Embryo: From the Third Through the Eighth Week

The start of the third week after conception initiates the *embryonic period*, during which the formless mass of cells becomes a distinct being—not yet recognizably human but worthy of a new name, **embryo.** (The word *embryo* is often used loosely, but each stage of development has a particular name; here, embryo refers to the developing human from day 14 to day 56.)

embryo The name for a developing human organism from about the third through the eighth week after conception.

First, a thin line (called the *primitive streak*) appears down the middle of the embryo; it will become the *neural tube* between 20 and 27 days after conception and eventually develop into the central nervous system (the brain and spinal column) (Stiles & Jernigan, 2010). The head appears in the fourth week, as eyes, ears, nose, and mouth start to form. Also in the fourth week, a minuscule blood vessel that will become the heart begins to pulsate.

By the fifth week, buds that will become arms and legs emerge. The upper arms and then forearms, palms, and webbed fingers grow. Legs, knees, feet, and webbed toes, in that order, emerge a few days later, each having the beginning of a skeletal structure. Then, 52 and 54 days after conception, respectively, the fingers and toes separate (Sadler, 2012).

As you can see, prenatally, the head develops first, in a *cephalo-caudal* (literally, "head-to-tail") pattern, and the extremities form last, in a *proximo-distal* (literally, "near-to-far") pattern. At the end of the eighth week after conception (56 days), the embryo weighs just one-thirtieth of an ounce (1 gram) and is about 1 inch (2½ centimeters) long. It has all the basic organs and body parts (except sex organs) of a human being, including elbows and knees. It moves frequently, about 150 times per hour, but this movement is imperceptible and random; it will be many months before deliberate movement occurs.

fetus The name for a developing human organism from the start of the ninth week after conception until birth



Meet Your Baby This is Elisa Clare McGuinness at 22 weeks post-conception She continued to develop well for the next 4 months, becoming a healthy, 3,572-gram newborn, finally able to meet her family—two parents and an older brother

Fetus: From the Ninth Week Until Birth

The organism is called a **fetus** from the beginning of the ninth week after conception until birth. The fetal period encompasses dramatic change, from a tiny, sexless creature smaller than the final joint of your thumb to a boy or girl about 20 inches (51 centimeters) long.

The Third Month

If the 23rd chromosomes are XY, the SRY gene on the Y triggers the development of male sexual organs. Otherwise, female organs develop. The male fetus experiences a rush of the hormone testosterone, affecting many structures and connections in the brain (Filová et al., 2013).

Of course, the range of brain and behavioral variations *among* males and *among* females is greater than the variations *between* the average man and woman. Nonetheless, neurological sex differences begin early in prenatal development.

By the end of the third month, the sex organs may be visible via **ultrasound** (in a *sonogram*), which is similar to an X-ray but uses sound waves instead of radiation. The 3-month-old fetus weighs about 3 ounces (87 grams) and is about 3 inches (7.5 centimeters) long. Early prenatal growth is very rapid, with considerable variation, especially in body weight. The numbers just given—3 months, 3 ounces, 3 inches—are rounded off for easy recollection. (Metric measures—100 days, 100 grams, 100 millimeters—are similarly imprecise yet useful.)

The Middle Three Months

In the fourth, fifth, and sixth months, the heartbeat becomes stronger. Digestive and excretory systems develop. Fingernails, toenails, and buds for teeth form, and hair grows (including eyelashes).

The brain increases about six times in size and develops many new neurons (*neurogenesis*) and synapses (*synaptogenesis*). Indeed, mid-pregnancy is the peak time for creation of new brain cells. Before this, the cortex had been smooth, but now the brain begins to have the folds and wrinkles that allow a human brain to be far larger and more complex than the brains of other animals (Stiles & Jernigan, 2010). Following the proximo-distal sequence, first the brain stem above the back of the neck, then the midbrain, and finally the cortex develop and connect.

Brain development occurs in every prenatal month, but these middle three months are especially crucial (Johnson, 2011). The entire central nervous system becomes responsive during mid-pregnancy, beginning to regulate basic body functions such as breathing and sucking. Advances in neurological functioning at the end of this trimester allow the fetus to reach the **age of viability,** the point of development when a fetus born far too early can become a baby who is able to survive.

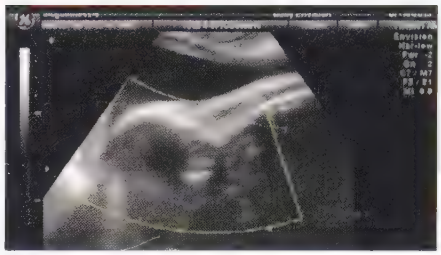
Survival is far from automatic; almost all 22-week-old newborns who were born a few decades ago died. Currently, if the fetus has been developing well, the mother is healthy, and birth occurs in an advanced neonatal unit, some very immature babies survive.

In Japan, with excellent neonatal care, 20 percent of 22-week-old newborns survive without major neurological impairment (Ishii et al., 2013). In developing nations, such small babies never live, and even in developed nations, many hospitals do not routinely initiate intensive care unless the fetus is at least 25 weeks old.

The Final Three Months

Reaching viability simply means that life outside the womb is *possible*. Many babies born between 22 and 24 weeks die, and survivors born before 27 weeks often develop slowly because they have missed some essential brain development in the uterus (Månsson & Stjernqvist, 2014). Each day of the final three months improves the odds not only of survival but also of a healthy life and normal cognition. (More on preterm birth appears later in this chapter.) Many aspects of prenatal life are awe-inspiring; the fact that an ordinary woman provides a far better home for a fetus than the most advanced medical technology can attain is one of them.

LaunchPad



COURTESY MANDY MOS...

Video: Prenatal Period: 3D Ultrasound shows a real-life ultrasound of a developing fetus.

ultrasound An image of a fetus (or an internal organ) produced by using high-frequency sound waves. (Also called *sonogram.*)

Especially for Biologists Many people believe that the differences between the sexes are sociocultural, not biological. Is there any prenatal support for that view? (see response, page 105)

age of viability The age (about 22 weeks after conception) at which a fetus might survive outside the mother's uterus if specialized medical care is available.



Almost Viable If this fetus were born, he might survive, although given his age (5 months) and sex (male), probably not Much better would be to stay in the uterus another four months, when his eyes would be open, ready to see

One of the Tiniest Rumaisa Rahman was born after 26 weeks and 6 days, weighing only 8.6 ounces (244 grams). Nevertheless, at age 5 she became a normal kindergartner. Rumaisa gained 5 pounds (2,270 grams) in the hospital and then, 6 months after her birth, went home. Her twin sister, Hiba, who weighed 1.3 pounds (590 grams) at birth, had gone home two months earlier and, ironically, was diagnosed with cerebral palsy at age 1 (Muraskas et al., 2012).



LOYOLA UNIVERSITY HEA

Video: Brain Development Animation: Prenatal
http://qrs.ly/j34eoyp



ALILA MEDICAL MEDIA/SHUTTERSTOCK

Organ Maturation Even at 26 weeks, a preterm infant is a tiny creature requiring intensive care for each gram of nourishment and every shallow breath. Breathing tubes and feeding tubes are needed, and often other special equipment as well. By contrast, after 37 weeks or more, the typical full-term newborn is ready to thrive at home on mother's milk—no expert help, oxygenated air, or special feeding required. For thousands of years, that is how humans survived: We would not be alive if any of our ancestors had required intense newborn care.

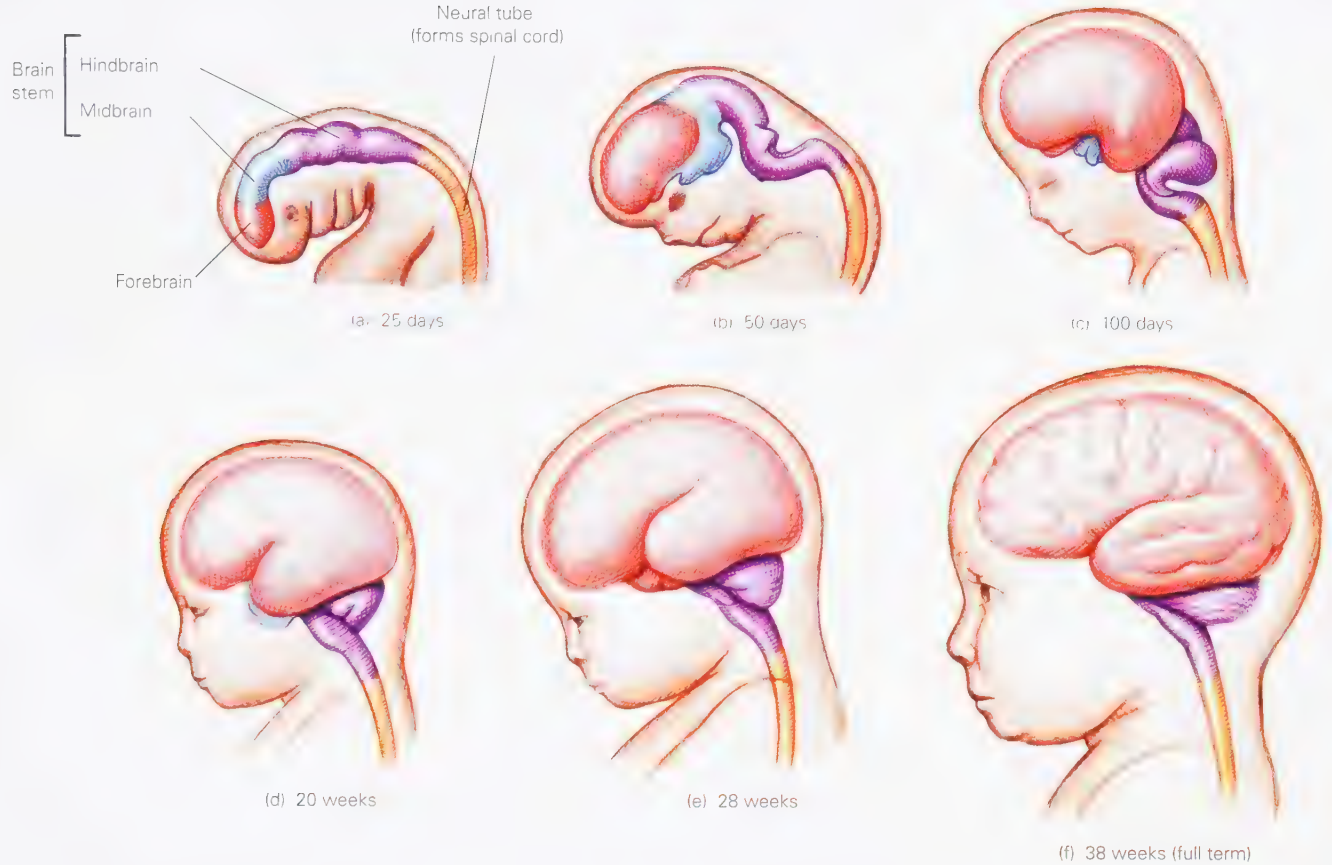
The critical difference between life and death, or between a fragile preterm newborn and a robust one, is maturation of the neurological, respiratory, and cardiovascular systems. As the brain matures, the organs of the body begin to work in harmony. The heart beats faster during activity; fetal movement as well as heart rate quiet down during rest (not necessarily when the mother wants to sleep).

In the final three months of prenatal life, the lungs begin to expand and contract, and breathing muscles are exercised as the fetus swallows (into the lungs, not the stomach) and spits out amniotic fluid. The valves of the heart go through a final maturation, as do the arteries and veins throughout the body.

In those final prenatal months, the brain not only develops more neurons, but also connects them to each other, destroying neurons that are not functioning. As the body matures, the skin of the skull thickens. That prevents "brain bleeds," one of the hazards of preterm birth in which paper-thin blood vessels in the skull collapse.

The fetus usually gains at least 4½ pounds (2.1 kilograms) in the third trimester, increasing to an average of about 7½ pounds (about 3.4 kilograms) at birth. By full term, human brain growth is so extensive that the *cortex* (the brain's advanced outer layers) has formed several folds in order to fit into the skull (see Figure 4.2). Although some large mammals (whales, for instance) have bigger brains than humans, no other creature needs as many folds because, relative to size, the human cortex contains much more material than the brains of non-humans.

The Mother–Child Relationship The relationship between mother and child intensifies during the final three months as the fetus's size and movement make the pregnant woman very aware of it. In turn, her sounds, the tastes of her food (via amniotic fluid), and her behavior patterns become part of fetal consciousness. If she is up at dawn, her newborn infant is likely to be wide-awake then as well.



Source: Adapted from Cowan, 1997, p. 116.

FIGURE 4.2

Prenatal Growth of the Brain Just 25 days after conception *(a)*, the central nervous system is already evident. The brain looks distinctly human by day 100 *(c)*. By 200 days after gestation *(e)*, at the very time brain activity begins, the various sections of the brain are recognizable. When the fetus is full term (266 days) *(f)*, all the parts of the brain, including the cortex (the outer layers), are formed, folding over one another and becoming more convoluted, or wrinkled, as the number of brain cells increases.

// **Response for Biologists** (from page 103): Only one of the 46 human chromosomes determines sex, and the genitals develop last in the prenatal sequence, suggesting that dramatic male–female differences are cultural. On the other hand, several sex differences develop before birth.

Auditory communication from mother to child begins at the 28th week and improves each week as fetal hearing (or newborn hearing if a baby is born early) becomes more acute (Bisiacchi et al., 2009). The fetus startles and kicks at loud noises, listens to the mother's heartbeat and voice, and is comforted by rhythmic music and movement, such as when the mother sings as she walks. Other voices are also heard, and many men begin to relate to their future child by stroking the mother's abdomen and talking to the fetus, thrilling to feel the kick.

If the mother is fearful or anxious, the fetal heart beats faster and body movements increase, and later, the infant is likely to startle at noises and unexpected sights. Maternal stress in pregnancy affects the fetus, infant, and child in many ways—although scientists do not agree on exactly how stress should be measured and what all the effects of prenatal anxiety are (Graignic-Philippe et al., 2014). Fathers can mitigate stress, and many do, not only with reassuring words but also with massage, provisioning, and so on.



BROMHALL/SCIENCE SOURCE

Can He Hear? A fetus, just about at the age of viability, is shown fingering his ear. Such gestures are probably random; but yes, he can hear

SUMMING UP In the first two weeks of rapid cell duplication, differentiation, and finally implantation, the newly conceived organism is transformed from a one-celled zygote to a many-celled embryo. The embryo soon develops the beginning of the central nervous system (3 weeks), a heart and a face (4 weeks), arms and legs (5 weeks), hands and feet (6 weeks), and fingers and toes (7 weeks), while the inner organs take shape. By 8 weeks, all the body structures except the male and female sex organs are in place. Fetal growth then proceeds rapidly, including mid-trimester weight gain (about 2 pounds, almost 1,000 grams) and brain maturation, which make viability possible. By full term (38 to 40 weeks), all the organs function well in the newborn, who usually weighs between 6 and 9 pounds, or between 2,700 and 4,000 grams. The relationship between parents and child intensifies as birth approaches.

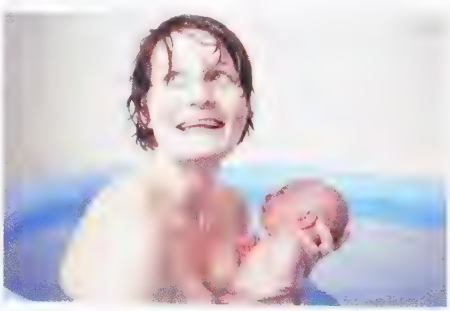
WHAT HAVE YOU LEARNED?

1. What are three major developments in the germinal period?
2. What body parts develop during the period of the embryo?
3. How much weight does the fetus gain, and when?
4. How does brain development affect survival?
5. What occurs between age of viability and full-term development?

Birth

About 38 weeks (266 days) after conception, the fetal brain signals the release of hormones, specifically *oxytocin*, to prepare the fetus and mother for labor. The average baby is born after 12 hours of active labor for first births and 7 hours for subsequent births, although often birth takes twice or half as long, with biological, psychological, and social circumstances all significant. The definition of "active" labor varies, which is one reason some women believe they are in active labor for days and others say 10 minutes.





FRANK HERHOLDT/GETTY IMAGES

Choice, Culture, or Cohort? Why do it that way? Both of these women (in Peru, on the *left*, in England, on the *right*) chose methods of labor that are unusual in the United States, where birth stools and birthing pools are uncommon. However, in all three nations, most births occur in hospitals—a rare choice a century ago.

Birthing positions also vary—sitting, squatting, lying down. Some women give birth while immersed in warm water, which helps the woman relax; some cultures expect women to be upright, supported by family members during birth; some doctors insist that a woman must lie down on her back. Figure 4.3 shows the universal stages of birth.

The Newborn's First Minutes

Newborns usually breathe and cry on their own. Between spontaneous cries, the first breaths of air bring oxygen to the lungs and blood, and the infant's color changes from bluish to pinkish. (Pinkish refers to blood color, visible beneath the skin, and applies to newborns of all hues.) Eyes open wide; tiny fingers grab; even tinier toes stretch and retract. The newborn is instantly, zestfully, ready for life.

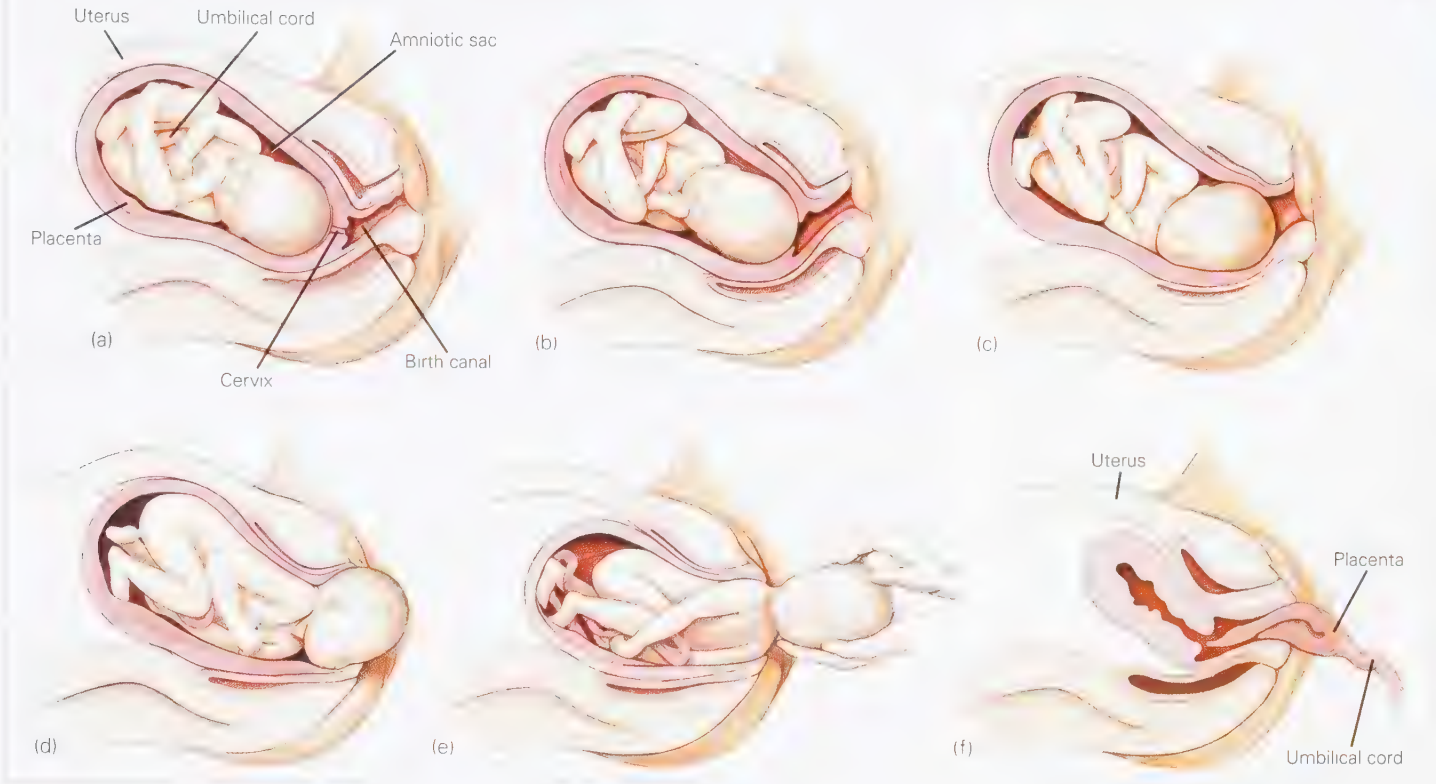


FIGURE 4.3

A Normal, Uncomplicated Birth *(a)* The baby's position as the birth process begins. *(b)* The first stage of labor: The cervix dilates to allow passage of the baby's head. *(c)* Transition: The baby's head moves into the "birth canal," the vagina. *(d)* The second stage of labor: The baby's head moves through the opening of the vagina (the baby's head "crowns") and *(e)* emerges completely. *(f)* The third stage of labor is the expulsion of the placenta. This usually occurs naturally, but the entire placenta must be expelled, so birth attendants check carefully. In some cultures, the placenta is ceremonially buried, to commemorate its life-giving role.

Nevertheless, there is much to be done. If birth occurs with a trained professional, mucus in the baby's throat is removed, especially if the first breaths seem shallow or strained. The umbilical cord is cut to detach the placenta, leaving an inch or so of the cord, which dries up and falls off several days later to leave the belly button. The infant is often given to the mother to preserve its body heat and to breast-feed a first meal of colostrum, a thick substance that helps the newborn's digestive and immune systems. Either before or after the mother holds the baby, the attending doctor or midwife weighs and examines the newborn, making sure that lungs, heart, legs, spine and so on are all as they should be.

Apgar scale A quick assessment of a newborn's health. The baby's color, heart rate, reflexes, muscle tone, and respiratory effort are given a score of 0, 1, or 2 twice—at one minute and five minutes after birth—and each time the total of all five scores is compared with the maximum score of 10 (rarely attained).

One widely used assessment of infant health is the **Apgar scale** (see Table 4.3), first developed by Dr. Virginia Apgar. When she earned her MD from Columbia

TABLE 4.3 Criteria and Scoring of the Apgar Scale

Five Vital Signs

Score	Color	Heartbeat	Reflex Irritability	Muscle Tone	Respiratory Effort
0	Blue, pale	Absent	No response	Flaccid, limp	Absent
1	Body pink, extremities blue	Slow (below 100)	Grimace	Weak, inactive	Irregular, slow
2	Entirely pink	Rapid (over 100)	Coughing, sneezing, crying	Strong, active	Good; baby is crying

Source: Apgar, 1953.

Medical School in 1933, Apgar wanted to become a surgeon but was told that only men did surgery. Consequently, she became an anesthesiologist. She saw that "delivery room doctors focused on mothers and paid little attention to babies. Those who were small and struggling were often left to die" (Beck, 2009, p. D-1).

To save those young lives, Apgar developed a simple rating scale of five vital signs—color, heart rate, cry, muscle tone, and breathing—to alert doctors to newborn health. Since 1950, birth attendants worldwide have used the Apgar (often remembering the acronym "Appearance, Pulse, Grimace, Activity, and Respiration") at one minute and again at five minutes after birth, assigning each vital sign a score of 0, 1, or 2. (See also Visualizing Development, p. 126.)

If the five-minute Apgar is 7 or higher, the baby is okay. If the five-minute total is below 7, emergency help is needed (the hospital loudspeaker may say, "Paging Dr. Apgar").

Medical Assistance

How closely any particular birth matches the foregoing description depends on the parents' preparation, the position and size of the fetus, and the customs of the culture.

The Cesarean

cesarean section (c-section) A surgical birth, in which incisions through the mother's abdomen and uterus allow the fetus to be removed quickly, instead of being delivered through the vagina. (Also called simply *section*.)

Midwives are as skilled at delivering babies as physicians, but in the United States only medical doctors are licensed to perform surgery. One-third of U.S. births occur via **cesarean section (c-section,** or simply *section*), whereby the fetus is removed through incisions in the mother's abdomen. Cesareans are controversial: The World Health Organization suggested that c-sections are medically indicated in only 15 percent of births. In some nations, cesareans are less than 5 percent of births, and birth is hazardous for both mother and child.

Most nations have fewer cesareans than the United States, but some—especially in Latin America—have more (see Figure 4.4). The rate has stabilized in the United States, but in many countries the rate is increasing. The most dramatic increases are in China, where the rate in 1991 was 5 percent, by 2001, 20 percent,

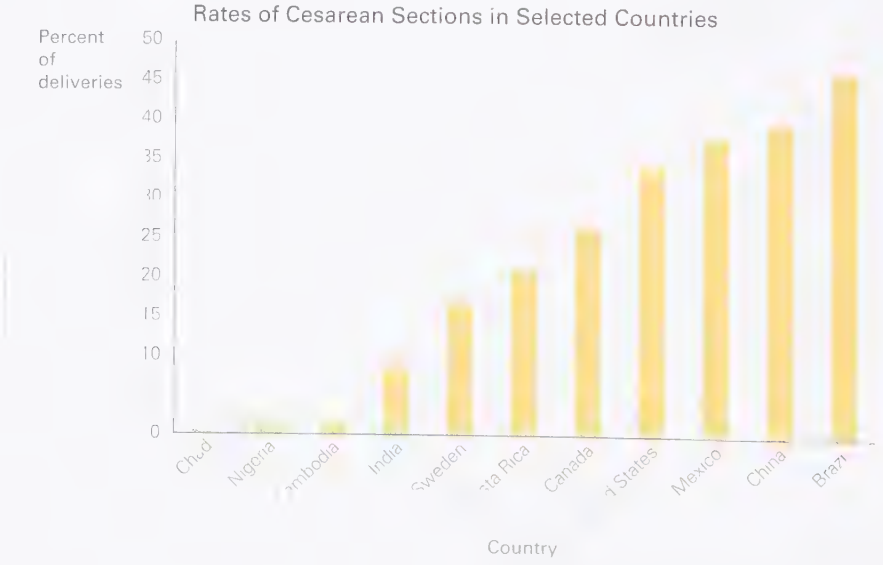


FIGURE 4.4

Too Many Cesareans or Too Few? Rates of cesarean deliveries vary widely from nation to nation. Latin America has the highest rates in the world (note that 45 percent of all births in Brazil are by cesarean), and sub-Saharan Africa has the lowest (the rate in Chad is less than half of 1 percent). The underlying issue is whether some women who should have cesareans do not get them, while other women have unnecessary cesareans. This data, from the United Nations, is an estimate as of 2010—rates may change every year.

and in 2008 40 percent nationwide with 64 percent in major cities (Feng et al., 2014; Juan, 2010).

In the United States, the rate rose between 1996 and 2008 (from 21 percent to 34 percent) before stabilizing. Variation is dramatic from one hospital to another—from 7 to 70 percent (Kozhimannil et al., 2013). Cesareans have many advantages for doctors and hospitals (easier to schedule, quicker, and more profitable).

One reason for the rise in c-sections is that modern medicine can eliminate pain in the lower half of the body while keeping the mother awake. One woman, named Resch, had a cesarean because her fetus was in a breech position (buttocks first, not head first).

> Resch felt "a lot of rough pushing and pulling" and "a painless suction sensation" as if her body were "a tar pit the baby was wrestled from." She heard the doctor say to the resident: "Hold her up by the hips," and Resch peered down. She saw her daughter for the first time, wet and squirming... Resch's husband held the baby next to Resch's cheek. Resch felt "overwhelmed by emotions . . . joy, awe, anxiety, relief, surprise." She gave thanks for her healthy baby, and for modern obstetrical care.
>
> *[Lake, 2012, p. 23]*

The disadvantages appear later. C-sections increase medical complications after birth and reduce breast-feeding (Malloy, 2009). By age 3, children born by cesarean have double the rate of childhood obesity: 16 percent compared to 8 percent (Huh et al., 2012). The reason may be that babies delivered vaginally have beneficial bacteria in their gut but those delivered surgically do not (Wallis, 2014).



YANG ZHAO/AFP/GETTY IMAGES

Pick Up Your Baby! Probably she can't. In this maternity ward in Beijing, China, most patients are recovering from cesarean sections, making it difficult to cradle, breast-feed, or carry a newborn until the incision heals.

Newborn Survival

A century ago, at least 5 of every 100 newborns in the United States died (De Lee, 1938), as did more than half of newborns in developing nations. In the least developed nations, the rate of newborn death is now about 1 in 20, although an accurate count is not available as some rural newborn deaths are not tallied. One estimate is that worldwide almost 2 million newborns (1 in 70) die each year (Rajaratnam et al., 2010).

Every year, an estimated 273,500 women die in pregnancy or birth, almost all of them in nations with very poor medical care (Alkire et al., 2012). A suggested solution is to increase training of doctors or midwives so that cesarean sections could be more available when women were unable to deliver vaginally.

Currently in the United States, newborn mortality (when a baby is born alive but dies in the first day) is about 1 in 250—a statistic that includes very fragile newborns weighing less than 1 pound. That rate is far too high; about forty nations do better. Nonetheless, in the United States and elsewhere, medical measures have saved millions of babies and thousands of women. Almost never does a woman in the United States die of complications of pregnancy, abortion, or birth—the rate is about 1 in 50,000, although some indications are that the rate is rising slightly, as more pregnancies are unintended (Finer & Zolna, 2014).

Critics point out, however, that survival should not be the only measure of success. Several aspects of birth arise from custom or politics, not from necessity.

A particular issue in medically-advanced nations concerns the attention lavished on "miracle babies" who require intensive care, microsurgery, and weeks in the hospital (Longo, 2013). Those who survive often, but not always, need special care all their lives. Only happy outcomes are published; the public cost and the family burden are not publicized.

Especially for Conservatives and Liberals
Do people's attitudes about medical intervention at birth reflect their attitudes about medicine at other points in their life span, in such areas as assisted reproductive technology (ART), immunization, and life support? (see response, page 112)

Questions of costs—emotional as well as financial—abound. All types of medical intervention vary more by doctor, hospital, day of the week, and region than by the circumstances of the birth—even in Sweden, where obstetric care is paid for by the government (Schytt & Waldenström, 2010).

A rare complication (uterine rupture), which sometimes happens when women give birth vaginally after a cesarean, has caused most doctors to insist that, after one cesarean, subsequent births must be cesarean. Many women and some experts think this is too cautious, but juries blame doctors for inaction more than for action. To avoid lawsuits, doctors intervene (Schifrin & Cohen, 2013).

Most U.S. births now take place in hospital labor rooms with high-tech operating rooms nearby in case they are needed. Another 5 percent of U.S. births occur in *birthing centers* (not in a hospital), and less than 1 percent occur at home (home births are illegal in some jurisdictions). About half of the home births are planned and half not, because of unexpectedly rapid labor. The unplanned ones are hazardous if no one is nearby to rescue a newborn in distress.



Compared with the United States, *planned* home births are more common in many other developed nations (2 percent in England, 30 percent in the Netherlands) where midwives are paid by the government. In the Netherlands, special ambulances called *flying storks* speed mother and newborn to a hospital if needed. Dutch research finds home births better for mothers and no worse for infants than hospital births (de Jonge et al., 2013).

A crucial question is how supportive the medical professionals are. One committee of obstetricians decided that

Mother Laboring, Doula Working In many nations, doulas work to help the birth process, providing massage, timing contractions, and preparing for birth. In the United States, doulas typically help couples decide when to leave home, avoiding long waits between hospital admittance and birth. Here, in Budapest, this expectant mother will have her baby with a licensed midwife at home. Nora Schimcsig is her doula; the two women will be together from this moment in early labor to the first breast-feeding of the newborn.

planned home births are acceptable because women have "a right to make a medically informed decision about delivery," but they also insisted that a trained midwife or doctor be present, that the woman not be high-risk (e.g., no previous cesarean), and that speedy transportation to a hospital be possible (American College of Obstetricians and Gynecologists Committee on Obstetric Practice, 2011).

Historically, women in hospitals labored by themselves until birth was imminent; fathers and other family members were kept away. No longer, as the opening anecdote illustrates. Almost everyone now agrees that a laboring woman should never be alone.

Many women have a **doula,** a person trained to support the laboring woman. Doulas time contractions, use massage, provide encouragement, and do whatever else is helpful. Every comparison study finds that the rate of medical intervention is lower when doulas are part of the birth team. Doulas have proven to be particularly helpful for immigrant, low-income, or unpartnered women who may be intimidated by doctors (Kang, 2014; Vonderheid et al., 2011).

doula Someone who helps with the birth process. Traditionally in Latin America, a doula was the only professional who attended childbirth. Now doulas are likely to arrive at the woman's home during early labor and later work alongside a hospital's staff.



Everyone Healthy and Happy A few decades ago in the developing world and a century ago in advanced nations, hospital births were only for birthing women who were near death, and only half of the fetuses survived. That has changed, particularly in Asia, where women prefer to give birth in hospitals. Hospital births themselves are not what they were. Most new mothers participate in the process: Here Le Thi Nga is about to greet her newborn after pulling with all her strength on the belt that helped her push out the head.

OBSERVATION QUIZ What evidence shows that even in Hanoi, technology is part of this birth? (see answer, page 113)

SUMMING UP Most newborns score at least 7 out of 10 on the Apgar scale and thrive without medical assistance. If necessary, neonatal surgery and intensive care save lives. Although modern medicine has reduced maternal and newborn deaths, many critics deplore treating birth as a medical crisis rather than a natural event. Responses to this critique include women choosing to give birth in hospital labor rooms rather than operating rooms, in birthing centers instead of hospitals, or even at home. The assistance of a doula is another recent practice that reduces medical intervention.

WHAT HAVE YOU LEARNED?

1. Why has the Apgar scale increased newborns' survival rate?
2. Why has the rate of cesarean sections increased?
3. Why are developmentalists concerned that surgery is often part of birth?
4. Why are home births more common in some nations than others?
5. Why do women choose to have a doula in addition to a midwife or doctor?

Response for Conservatives and Liberals (from page 110): Yes, some people are much more likely to want nature to take its course. However, personal experience often trumps political attitudes about birth and death; several of those who advocate hospital births are also in favor of spending one's final days at home.

Harm to the Fetus

The early days of life place the developing human on the path toward health and success—or not. Fortunately, healthy newborns are the norm, not the exception. However, if something is amiss, it is often part of a cascade that may become overwhelming (Rossignol et al., 2014).

Harmful Substances

A cascade may begin before a woman realizes she is pregnant, as many toxins, illnesses, and experiences can cause harm early in pregnancy. Every week, scientists discover an unexpected **teratogen,** which is anything—drugs, viruses, pollutants, malnutrition, stress, and more—that increases the risk of prenatal abnormalities and birth complications.

teratogen An agent or condition, including viruses, drugs, and chemicals, that can impair prenatal development and result in birth defects or even death.

behavioral teratogens Agents and conditions that can harm the prenatal brain, impairing the future child's intellectual and emotional functioning.

One of my students told me that she now knew all the things that can go wrong, so she never wanted to have a baby. As I explained to her and as you will now read, most problems can be avoided, mitigated, or remedied. Prenatal life is not a dangerous period to be feared; it is a natural process to be protected. The outcome is usually a wonderfully formed newborn.

Behavioral Teratogens

Some teratogens cause no physical defects but affect the brain, making a child hyperactive, antisocial, or learning-disabled. These are **behavioral teratogens.** About 20 percent of all children have difficulties that *could* be connected to behavioral teratogens, although the link is not straightforward: The cascade is murky. One of my students wrote:

> I was nine years old when my mother announced she was pregnant. I was the one who was most excited. . . . My mother was a heavy smoker, Colt 45 beer drinker and a strong caffeine coffee drinker.
>
> One day my mother was sitting at the dining room table smoking cigarettes one after the other. I asked "Isn't smoking bad for the baby? She made a face and said "Yes, so what?"
>
> I said " So why are you doing it?"
>
> She said, "I don't know.". . .
>
> During this time I was in the fifth grade and we saw a film about birth defects. My biggest fear was that my mother was going to give birth to a fetal alcohol syndrome (FAS) infant. . . . My baby brother was born right on schedule. The doctors claimed a healthy newborn. . . . Once I heard healthy, I thought everything was going to be fine. I was wrong, then again I was just a child. . . .
>
> My baby brother never showed any interest in toys. . . . [H]e just cannot get the right words out of his mouth. . . . [H]e has no common sense. . . .
>
> Why hurt those who cannot defend themselves?
>
> *[J., personal communication]*

GILLES MINGASSON/GETTY IMAGES



Swing High and Low Adopted by loving parents but born with fetal alcohol syndrome, Philip, shown here at age 11, sometimes threatened to kill his family members. His parents sent him to this residential ranch in Eureka, Montana (nonprofit, tuition $3,500 a month) for children like him. This moment during recess is a happy one; it is not known whether he learned to control his fury.

As you remember from Chapter 1, one case proves nothing. J. blames her mother, although genes, postnatal experiences, and lack of preventive information and services may be part of the cascade as well. Nonetheless, J. rightly wonders why her mother took a chance.

Especially for Judges and Juries How much protection, if any, should the legal system provide for fetuses? Should pregnant women with alcoholism be jailed to prevent them from drinking? What about people who enable them to drink, such as their partners, their parents, bar owners, and bartenders? (see response, page 115)

Behavioral teratogens can be subtle, yet their effects may last a lifetime. That is one conclusion from research on the babies born to pregnant women exposed to flu during the pandemic of 1918. By middle age, although some of these babies became wealthy, happy, and brilliant, on average those born in flu-ravaged regions had less education, employment, and income than those born a year earlier (Almond, 2006). They are almost all dead now, dying a few years earlier than if their prenatal life had begun in 1917 or 1919.

Risk Analysis

Life requires risks: We analyze which chances to take and how to minimize harm. To pick an easy example: Crossing the street is risky. Knowing that, we cross carefully; it would be much more harmful to stay on our block.

Risk analysis is crucial throughout human development (Sheeran et al., 2014). You read in Chapter 3 that pregnancy after age 35 increases the chance of many disorders, but mature parents are more likely to have many assets, psychological as well as material, that benefit their children. Depending on many aspects of the social context, it may be wise to have a baby at age 18 or 42 or any other age. Always, risk analysis is needed; many problems can be prevented or overcome.

Although all teratogens increase the *risk* of harm, none *always* causes damage; risk analysis involves probabilities, not certainties, and resilient and protective influences are relevant (Aven, 2011). The impact of teratogens depends on the interplay of many factors, both destructive and constructive, an example of the dynamic-systems perspective described in Chapter 1.

// ANSWER TO OBSERVATION QUIZ (from page 111): The computer print-out on the far right. Monitors during labor track contractions, fetal heart rate, and sometimes more, printing out the record minute-by-minute, so medical staff can judge whether to speed up labor or birth. In this case, no medical help was required.

The Critical Time

Timing is crucial. Some teratogens cause damage only during a *critical period* (see Figure 4.5). (**Developmental Link:** Critical and sensitive periods are described in Chapter 1.) Obstetricians recommend that *before* pregnancy occurs, women should avoid drugs (especially alcohol), supplement a balanced diet with extra folic acid and iron, update their immunizations, and gain or lose weight if needed. Indeed, pre-conception health is at least as important as post-conception health (see Table 4.4).

TABLE 4.4 Before Pregnancy

What Prospective Mothers Should Do	What Prospective Mothers Really Do (U.S. Data)
1. Plan the pregnancy.	1. At least a third of all pregnancies are not intended.
2. Take a daily multivitamin with folic acid.	2. About 60 percent of women aged 18 to 45 do not take multivitamins.
3. Avoid binge-drinking (defined as four or more drinks in a row).	3. One in seven women in their childbearing years binge-drink.
4. Update immunizations against all teratogenic viruses, especially rubella.	4. Unlike in many developing nations, relatively few pregnant women in the United States lack basic immunizations.
5. Gain or lose weight, as appropriate.	5. About one-third of all U.S. women of childbearing age are obese, and about 5 percent are underweight. Both extremes increase complications.
6. Reassess use of prescription drugs.	6. Ninety percent of pregnant women take prescription drugs (not counting vitamins).
7. Develop daily exercise habits.	7. More than half of women of childbearing age do not exercise.

Sources: Bombard et al., 2013, MMWR, (July 20, 2012); Brody, 2013; Mosher et al., 2012; U.S. Department of Health and Human Services, 2012

The first days and weeks after conception (the germinal and embryonic periods) are critical for body formation, but health during the entire fetal period affects the brain, and thus behavioral teratogens affect the fetus at any time. Some teratogens that cause preterm birth or low birthweight are particularly harmful in the second half of pregnancy.

In fact, one study found that although smoking cigarettes throughout prenatal development can harm the fetus, smokers who quit early in pregnancy had no higher risks of birth complications than did women who never smoked (McCowan et al., 2009). Another longitudinal study of 7-year-olds found that, although alcohol is a teratogen at every period of pregnancy, binge drinking in the last trimester was more harmful to the brain (Niclasen et al., 2014).

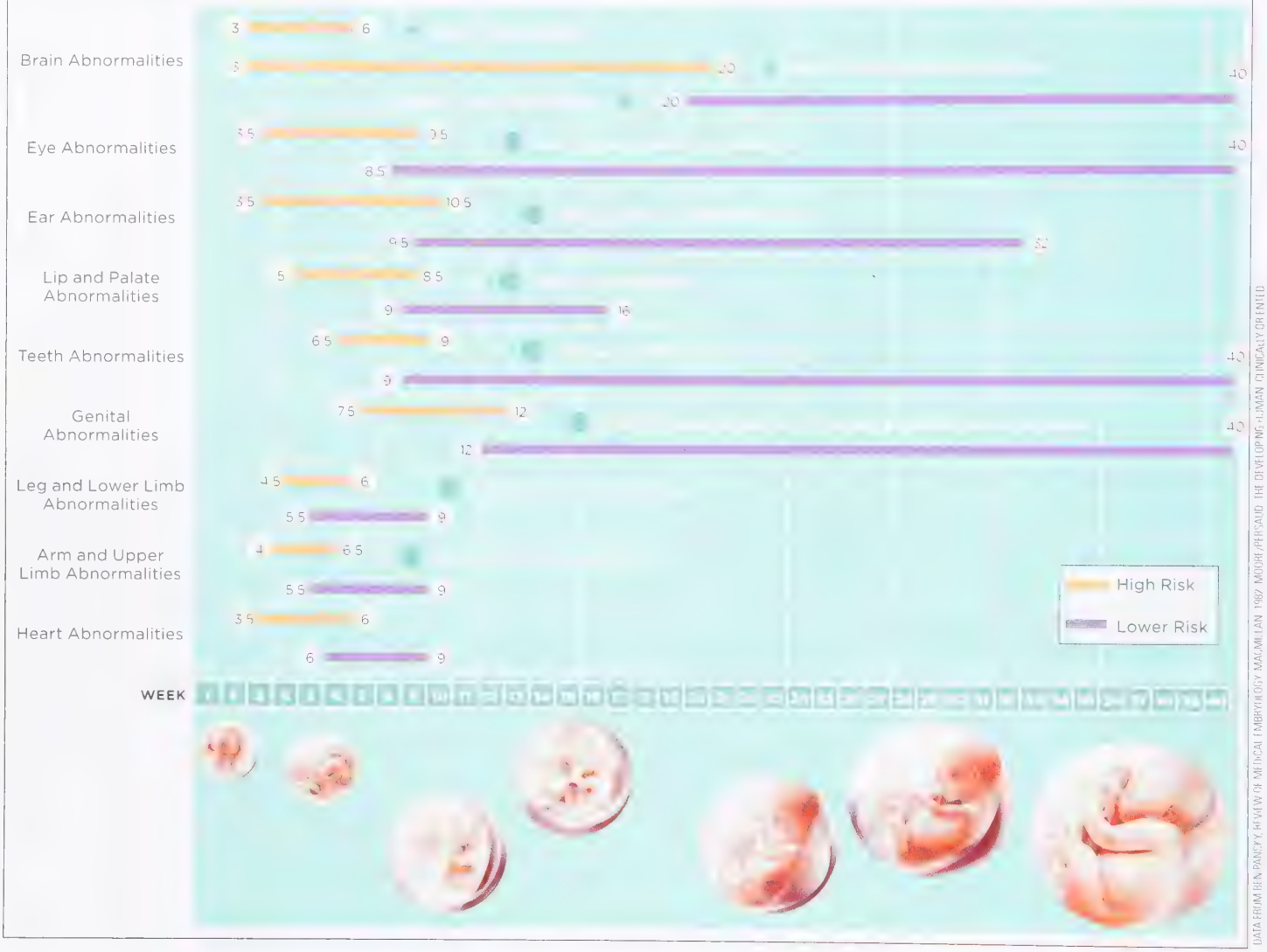
How Much Is Too Much?

A second factor affecting the harm from teratogens is the dose and/or frequency of exposure. Some teratogens have a **threshold effect;** they are virtually harmless

threshold effect In prenatal development, when a teratogen is relatively harmless in small doses but becomes harmful once exposure reaches a certain level (the threshold).

FIGURE 4.5

The embryonic period (from the third to the eight week) is the most sensitive time for causing structural birth defects. Organs have different periods of sensitivity to birth defects: Some are vulnerable for a long time (e.g., the brain), others for a shorter time (e.g., the arms). The embryonic period (weeks 3 to 8) is the most sensitive time for structural birth defects. During the fetal period, the brain is the most at risk for defects. Sometimes teratogens can affect multiple organs at the same time. Individual differences in susceptibility to teratogens may be caused by a fetus's genetic makeup or peculiarities of the mother, including the effectiveness of her placenta or her overall health. The dose and timing of the exposure are both important.



DATA FROM BEN-PANTY, REVIEW OF MEDICAL EMBRYOLOGY, MACMILLAN, 1997; MOORE/PERSAUD, THE DEVELOPING HUMAN: CLINICALLY ORIENTED EMBRYOLOGY, SAUNDERS, AND ENDOTEXT.ORG; TERATOGENIC CAUSES OF MALFORMATIONS; ANN CLIN LAB SCI SPRING, 2010; VOL. 40 NO. 2 99-114

until exposure reaches a certain level, at which point they "cross the threshold" and become damaging. This threshold is not a fixed boundary: Dose, timing, frequency, and other teratogens affect when the threshold is crossed (O'Leary et al., 2010).

A few substances are beneficial in small amounts but fiercely teratogenic in large quantities. Vitamin A, for instance, is essential for healthy development but causes abnormalities if the dose is 50,000 units per day or higher (obtained only in pills, don't worry about eating carrots) (Naudé et al., 2007). Experts rarely specify thresholds, partly because one teratogen may affect the threshold of another. Alcohol, tobacco, and marijuana are more teratogenic, with a lower threshold for each, when all three are combined.

Is there a safe dose for psychoactive drugs? Consider alcohol. During the period of the embryo, a mother's heavy drinking can cause **fetal alcohol syndrome (FAS)**,

fetal alcohol syndrome (FAS) A cluster of birth defects, including abnormal facial characteristics, slow physical growth, and reduced intellectual ability, that may occur in the fetus of a woman who drinks alcohol while pregnant.

which distorts the facial features of a child (especially the eyes, ears, and upper lip). Later in pregnancy, alcohol is a behavioral teratogen.

However, alcohol during pregnancy does not always result in evident harm. If it did, almost everyone born in Europe before 1980 would be affected, since wine or beer was part of most Europeans' daily diet.

Currently, pregnant women are advised to avoid alcohol, but women in the United Kingdom receive conflicting advice about drinking an occasional glass of wine (Raymond et al., 2009). French women are told to abstain, but many (between 12 and 63 percent, depending on specifics of the research) do not heed that message (Dumas et al., 2014). Should all women who might become pregnant refuse a legal substance that men use routinely? Wise? Probably. Necessary? Maybe not.

Innate Vulnerability

Genes are a third factor that influence the effects of teratogens. When a woman carrying dizygotic twins drinks alcohol, for example, the twins' blood alcohol levels are equal; yet one twin may be more severely affected than the other because their alleles for the enzyme that metabolizes alcohol differ. Differential susceptibility is evident for fetal alcohol disorders, and probably for many other problems as well (McCarthy & Eberhart, 2014).

The Y chromosome may make male fetuses more vulnerable to many problems. Boys are more likely to be spontaneously aborted or stillborn and also more likely to be harmed by teratogens than female fetuses are. This is true overall, but the male/female hazard rate differs from one teratogen to another (Lewis & Kestler, 2012).

Genes are important not only at conception but also during pregnancy. One maternal allele results in low levels of folic acid in a woman's bloodstream and hence in the embryo, which can produce *neural-tube defects*—either *spina bifida*, in which the tail of the spine is not enclosed properly (enclosure normally occurs at about week 7), or *anencephaly*, when part of the brain is missing. Neural-tube defects are more common in certain ethnic groups (Irish, English, and Egyptian), but the crucial maternal allele is rare among Asians and sub-Saharan Africans (Mills et al., 1995).

Since 1998 in the United States, manufacturers have had to add folic acid to every packaged cereal, an intervention that reduced neural-tube defects by 26 percent in the first three years after the law went into effect (MMWR, September 13, 2002). But some women rarely eat cereal and do not take vitamins. Data by region is not always available, but in 2010 in Appalachia (where many women are of British descent), about 1 newborn in 1,000 had a neural-tube defect.

Applying the Research

Results of teratogenic exposure cannot be predicted precisely in individual cases. However, much is known about destructive and damaging teratogens, including what individuals and society can do to reduce the risks. Table 4.5 lists some teratogens and their possible effects, as well as preventive measures.

General health during pregnancy is at least half the battle. Women who maintain good nutrition and avoid drugs and teratogenic chemicals (which are often found in pesticides, cleaning fluids, and cosmetics) usually have healthy babies. Some medications are necessary (e.g., for women with epilepsy, diabetes, and severe depression), but consultation should begin *before* conception.

Many women assume that herbal medicines or over-the-counter drugs are safe. Not so. As pediatrics professor Allen Mitchell explains, "Many over-the-counter drugs were grandfathered in with no studies of their possible effects during pregnancy" (quoted in Brody, 2013, p. D 5).



Smoke-free Babies Posters such as this one have had an impact. Smoking among adults is only half of what it was thirty years ago, a third of women smokers quit when they know they are pregnant, while the other two-thirds cut their smoking in half. Unfortunately, the heaviest smokers are least likely to quit—they need more than posters to motivate them to break the habit.

Especially for Nutritionists Is it beneficial that most breakfast cereals are fortified with vitamins and minerals? (see response, page 119)

Response for Judges and Juries (from page 112): Some laws punish women who jeopardize the health of their fetuses, but a developmental view would consider the micro-, exo-, and macrosystems.

Table 4.3 Teratogens: Effects of Exposure and Prevention of Damage*

Teratogens	Effects of Exposure on Fetus	Measures for Preventing Damage (Laws, doctors, and individuals can all increase prevention)
Diseases		
Rubella (German measles)	Hearing impairment, heart defects, eye abnormalities, mental retardation, miscarriage, stillbirth	Vaccination before pregnancy
HIV/AIDS	Infection, AIDS, death	Abstinence, safer sex practices, clean needles
Cytomegalovirus (CMV)	Hearing loss, mental retardation	None
Syphilis	Deformities, miscarriage, stillbirth, death	Abstinence, safer sex practices, prenatal testing and treatment
HPV	Miscarriage, stillbirth, premature birth, low birth weight, genital warts, cervical cancer	Abstinence, safer sex practices, vaccination
Other sexually transmitted diseases (chlamydia, gonorrhea, herpes, hepatitis B)	Miscarriage, stillbirth, premature birth, low birth weight, infection, death	Abstinence, safer sex practices, prenatal testing and treatment
Toxoplasmosis (contracted from contact with infected cat feces or undercooked meat)	Miscarriage, stillbirth, premature birth, low birth weight, mental retardation, blindness, death	Avoid cat feces, cook meat thoroughly
Pollutants		
Polychlorinated biphenyls (PCBs), dioxins, polybrominated diphenyl ethers (PBDEs), lead, mercury, pesticides, herbicides	Miscarriage, stillbirth, premature birth, low birth weight, mental retardation, death	Avoid contaminated fish, avoid exposure to pesticides, herbicides, and lead
Radiation		
Medical diagnostic procedures (X-rays, CT scans)	Miscarriage, stillbirth, premature birth, low birth weight, mental retardation, death	Shield abdomen, avoid procedures during pregnancy
Social and Behavioral Factors		
Maternal stress	Miscarriage, stillbirth, premature birth, low birth weight, temperament problems	Stress reduction techniques, counseling
Malnutrition	Miscarriage, stillbirth, premature birth, low birth weight, mental retardation, death	Nutritional counseling, vitamin supplements
Excessive weight gain during pregnancy	Miscarriage, stillbirth, premature birth, low birth weight, death	Nutritional counseling
Medicinal Drugs		
Alcohol	Fetal alcohol syndrome	Abstinence
Tobacco	Low birth weight	Abstinence
Retinoic acid	Can cause malformations	Avoid medication, prescribe safe alternatives, give oral contraceptives, use birth control
Streptomycin	Can cause deafness	
Aminopterin	Miscarriage, stillbirth, premature birth, low birth weight, death	
Chloramphenicol	Miscarriage, stillbirth, premature birth, low birth weight, death	
Thalidomide	Miscarriage, stillbirth, premature birth, low birth weight, death	

(Continued)

Psychoactive Drugs		
Caffeine	Normal, modest use poses no problem.	Avoid excessive use. (Note that coffee, tea, cola drinks, and chocolate all contain caffeine).
Alcohol	May cause fetal alcohol syndrome (FAS) or fetal alcohol effects (FAE).	Stop or severely limit alcohol consumption; especially dangerous are three or more drinks a day or four or more drinks on one occasion.
Tobacco	Reduces birthweight, increases risk of malformations of limbs and urinary tract, and may affect the baby's lungs.	Ideally, stop smoking before pregnancy. Stopping during pregnancy also beneficial.
Marijuana	Heavy exposure affects central nervous system; when smoked, may hinder fetal growth.	Avoid or strictly limit marijuana consumption.
Heroin	Slows fetal growth, increases prematurity. Addicted newborns need treatment to control withdrawal.	Treatment needed before pregnancy but if already pregnant, gradual withdrawal on methadone is better than continued use of heroin.
Cocaine	Slows fetal growth, increases prematurity and then learning problems.	Stop before pregnancy; if not, babies need special medical and educational attention in their early years.
Inhaled solvents (glue or aerosol)	May cause abnormally small head, crossed eyes, and other indications of brain damage.	Stop before becoming pregnant; damage can occur before a woman knows she is pregnant.

* The field of toxicology advances daily. Research on new substances begins with their effects on nonhuman species, which provides suggestive (though not conclusive) evidence. This table is a primer; it is no substitute for careful consultation with a knowledgeable professional. A useful website provided by the Organization of Teratology Specialists (in English and Spanish) that lists many specific teratogenic drugs is http://www.otispregnancy.org.

Sadly, a cascade of teratogens is most likely to begin with women who are already vulnerable. For example, cigarette smokers are more often drinkers (as was J.'s mother), and those whose jobs require exposure to chemicals and pesticides (such as migrant workers) are more often malnourished and lack access to medical care (McLaurin, 2014).

a view from science

Conflicting Advice

Pregnant women want to know about the thousands of drugs, chemicals, and diseases that might harm the fetus, yet, as explained in Chapter 1, the scientific method is designed to be cautious. It takes years for replication, data from alternate designs, and exploration of various hypotheses to reach sound conclusions.

On almost any issue, scientists disagree until the weight of evidence is unmistakable. It took decades before all researchers agreed on such (now obvious) teratogens as rubella and cigarettes.

One current dispute is whether pesticides should be allowed on the large farms that produce most of the fruits and vegetables for consumption in the United States. No biologist doubts that pesticides harm frogs, fish, and bees, but the pesticide industry insists that careful use (e.g., spraying on plants, not workers) does not harm people. Developmentalists, however, worry that pregnant women who breathe these toxins might have children with brain damage. As one scientist said "pesticides were designed to be neurotoxic. Why should we be surprised if they cause neurotoxicity?" (Lambhear, quote in Mascarelli, 2013, p. 741).

Scientists have convinced the U.S. government to ban one pesticide, chlorpyrifos, from household use (it once was commonly used to kill roaches and ants), but that drug is still widely used in agriculture and is used in homes in other nations. There is evidence from analyzing blood in the umbilical cord that many fetuses are exposed to chlorpyrifos, and longitudinal research finds that these children have lower intelligence and more

behavior problems than other children (Horton et al., 2012). However, Dow Chemical Company, which sells the pesticide, argues that the research does not take into account all the confounding factors, such as the living conditions of farm-workers' children (Mascarelli, 2013).

In this dispute, developmentalists choose to protect the fetal brain, which is why this chapter advises pregnant women to avoid pesticides. However, on many other teratogens, developmentalists themselves are conflicted. Fish consumption and exposure to plastics are examples.

Pregnant women in the United States are told to eat less fish, but those in the United Kingdom are told to eat more fish. The reason for these opposite messages is that fish contains mercury (a teratogen) and DHA (an omega-3 fatty acid needed for fetal brain development). Scientists weigh the benefits and risks of fish consumption, and wonder how to teach women how to judge each kind of fish and where it swam, choosing benefits while avoiding risks (Lando & Lo, 2014).

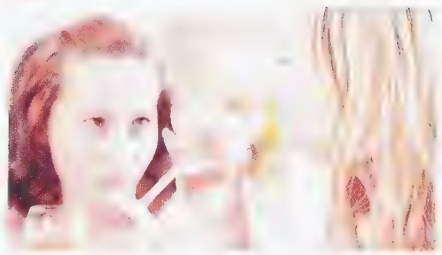
Another dispute involves bisphenol A (commonly used in plastics), banned in Canada but allowed in the United States. Traces of the substance are found in the urine of most pregnant women, but most scientists think that very low amounts are harmless. The question is, where is the threshold?

Many experiments on rodents find bisphenol A teratogenic. For example, when pregnant rats are exposed to bisphenol A, even low doses affect sexual organs (Christiansen et al., 2014).

Confirmation regarding the effects of exposure on humans is difficult. Controlled experiments are unethical: No one would deliberately raise bisphenol A levels in pregnant women to see if it harmed their offspring. Surveys give conflicting results, partly because other key variables—age, education, income—correlate with both urine levels of the chemical and intelligence of children. Should regulations be guided by experiments on mice? The answer depends on a person's attitudes about plastic, pregnancy, and politics.

To make all this more difficult, pregnant women are, ideally, happy and calm: Stress and anxiety affect the fetus. Pregnancy often increases fear and anxiety (Rubertsson et al., 2014); scientists do not want to add to the worry. Prospective parents want clear, immediate answers, yet scientists cannot always provide them.

LaunchPad



DDW SHUTTERSTOCK

Video Activity: Teratogens explores the factors that enable or prevent teratogens from harming a developing fetus.

Advice from Doctors

Although prenatal care is helpful in protecting the developing fetus, even doctors are not always careful. One concern is pain medication. Opioids (narcotics) may do damage to the fetus and aspirin may cause excessive bleeding during birth. Yet a recent study found that 23 percent of pregnant women on Medicaid are given a prescription for a narcotic (Desai et al., 2014).

Worse still is that some doctors do not ask women about harmful life patterns. For example, one Maryland study found that almost one-third of pregnant women were not asked about their alcohol use (Cheng et al., 2011). Those who were over age 35 and college educated were least likely to be queried. Did their doctors assume they knew the dangers? Wrong. This study and other research have found that such women are the most likely to drink during pregnancy.

To learn what medications are safe in pregnancy, women often consult the Internet. However, a study of 25 websites that together listed 235 medications as safe, found that only 103 of those 235 had been assessed by TERIS (a respected national panel of teratologists who evaluate the impact of drugs on prenatal development). Further, of those 103, only 60 were considered safe. The rest were not *proven* harmful, but the experts felt there was not enough evidence to state they were safe (Peters et al., 2013). Many of these 25 Internet sites used unreliable evidence, and sometimes the same drug was on the safe list of one site and the danger list of another.

What Do We Know?

Now we know that prenatal teratogens can cause structural problems during the embryonic period and several diseases throughout pregnancy, as well as behavioral

problems and reproductive impairment later in life. But it is not easy to know which teratogens, at what doses, when, and for whom. Almost every common disease, almost every food additive, most prescription and nonprescription drugs (even caffeine and aspirin), many minerals and chemicals in the air and water, emotional stress, exhaustion, and poor nutrition *might* impair prenatal development—but only at some times, in some amounts, in some mammals.

Most research is conducted with mice; harm to humans is rarely proven to everyone's satisfaction. That is not surprising, since hundreds of thousands of drugs, diseases, and pollutants are now evident, many of them newly developed or newly diagnosed. It takes careful, replicated research before scientists reach a consensus, and then wide communication before women are aware of risks.

Even for proven risks, as with alcohol and cigarettes, many pregnant women are not convinced. In the United States, from 2006 to 2010, nearly 8 percent of pregnant women drank alcohol, with rates higher (10 percent) among women with a college degree (see Figure 4.6).

Furthermore, even when evidence seems clear, the proper social response is controversial. It is legal to arrest and jail pregnant women who use alcohol or other psychoactive drugs in six states (Minnesota, North Dakota, Oklahoma, South Dakota, Tennessee, and Wisconsin).

If a baby is stillborn and the mother used meth, she may be convicted of murder, as occurred for an Oklahoma woman, Theresa Hernandez, who was sentenced to 15 years (Fentiman, 2009). Alabama jailed several new mothers because their babies had illegal substances in their bloodstream (Eckholm, 2013). Many doctors and developmentalists worry that such penalties make women reluctant to see a doctor when they are pregnant, or even to have the baby in a hospital.

// **Response for Nutritionists** (from page 115): Useful, yes; optimal, no. Some essential vitamins are missing (too expensive), and individual nutritional needs differ, depending on age, sex, health, genes, and eating habits. The reduction in neural-tube defects is good, but many women don't eat cereal or take vitamin supplements before becoming pregnant.

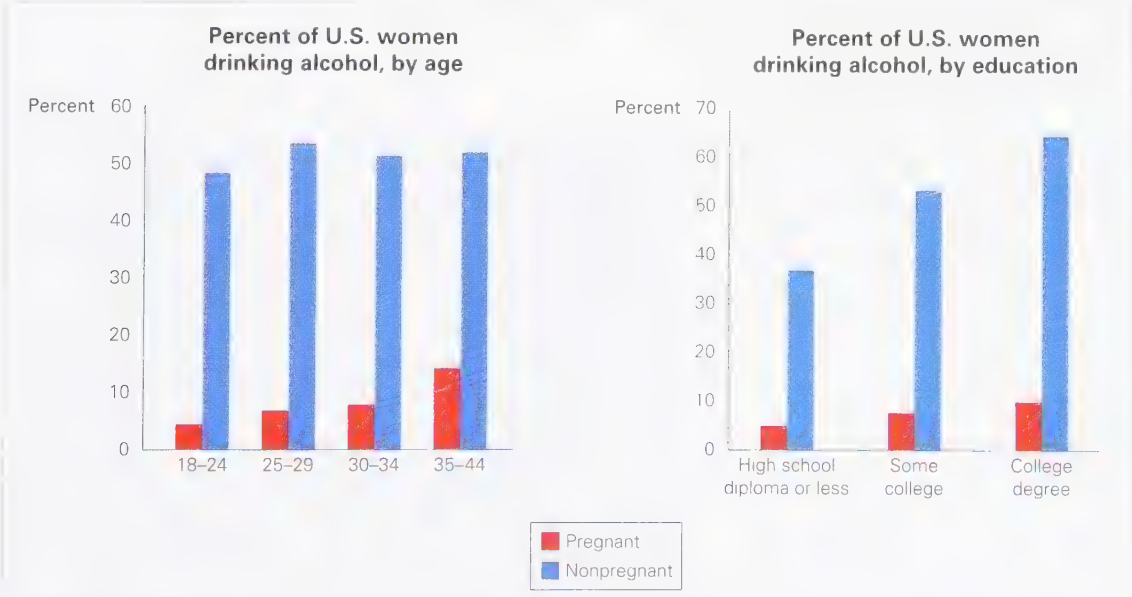


FIGURE 4.6

Trouble Ahead About half of U.S. women drink alcohol. That is not troubling, since occasional drinking in adulthood seems harmless. Most women stop drinking when they are pregnant. This is what almost all experts recommend, since drinking increases the risk of facial abnormalities in the first trimester and of brain damage throughout. The pregnant rates here are of women still reporting "any use" of alcohol in the third trimester. The data is frightening, since most neurons of the prefrontal cortex develop in the final months of pregnancy. Apparently, older is not wiser, and education does not lead to abstinence—quite the opposite. Since alcohol is a proven risk to the fetal brain, do 14 percent of older pregnant women suffer from alcoholism, unable to quit?

Especially for Social Workers When is it most important to convince women to be tested for HIV: before pregnancy, after conception, or immediately after birth? (see response, page 122)

Prenatal Care

Seeing a medical professional in the first trimester has many benefits: Women learn what to eat, what to do, and what to avoid. Some serious conditions, syphilis and HIV among them, can be diagnosed and treated before they harm the fetus. Prenatal tests (of blood, urine, and fetal heart rate as well as ultrasound) reassure parents, facilitating the crucial parent-child bond, long before fetal movement is apparent.

In general, early care protects fetal growth, makes birth easier, and renders parents better able to cope. When complications (such as twins, gestational diabetes, and infections) arise, early recognition increases the chance of a healthy birth. As birth approaches, prospective parents often attend classes where they learn about the birth process, including what they can do in the final weeks and hours, and that itself reduces confusion and increases the odds of a healthy newborn.

false positive The result of a laboratory test that reports something as true when in fact it is not true. This can occur for pregnancy tests, when a woman might not be pregnant even though the test says she is, or during pregnancy when a problem is reported that actually does not exist.

Unfortunately, however, about 20 percent of early pregnancy tests *raise* anxiety instead of reducing it. For instance, the level of alpha-fetoprotein (AFP) may be too high or too low, or ultrasound may indicate multiple fetuses, abnormal growth, Down syndrome, or a mother's narrow pelvis. Many such warnings are **false positives;** that is, they falsely suggest a problem that does not exist. Any warning, whether false or true, requires further testing, worry, and soul-searching. Consider the following.

opposing perspectives

"What Do People Live to Do?"

John and Martha, both under age 35, were expecting their second child. Martha's initial prenatal screening revealed low alpha-fetoprotein, which could indicate Down syndrome.

> Another blood test was scheduled. . . . John asked:
>
> "What exactly is the problem?" . . .
>
> "We've got a one in eight hundred and ninety-five shot at a retarded baby."
>
> John smiled, "I can live with those odds."
>
> "I'm still a little scared."
>
> He reached across the table for my hand. "Sure," he said, "that's understandable. But even if there is a problem, we've caught it in time. . . . The worst-case scenario is that you might have to have an abortion, and that's a long shot. Everything's going to be fine." . . .
>
> "I might *have to have* an abortion?" The chill inside me was gone. Instead I could feel my face flushing hot with anger. "Since when do you decide what I *have* to do with my body?"



Happy Boy Martha Beck not only loves her son Adam (shown here), but she also writes about the special experiences he has brought into the whole family's life—hers, John's, and their other children's. She is "pro-choice"; he is a chosen child.

Complications During Birth

Any birth complication usually has multiple causes: A fetus is low birthweight, preterm, genetically vulnerable, or exposed to teratogens, *and* a mother is unusually young, old, small, stressed, or ill. As an example, **cerebral palsy** (a disease marked by difficulties with movement) was once thought to be caused solely by birth procedures (excessive medication, slow breech birth, or use of forceps to pull the fetal head through the birth canal). However, we now know that cerebral palsy results from genetic sensitivity, teratogens, and maternal infection (Mann et al., 2009), worsened by insufficient oxygen to the fetal brain at birth.

A lack of oxygen is **anoxia.** Anoxia often occurs for a second or two during birth, indicated by a slower fetal heart rate, with no harm done. To prevent prolonged anoxia, the fetal heart rate is monitored during labor and the Apgar is used immediately after birth.

Again, however, anoxia is only part of a cascade. How long anoxia can continue without harming the brain depends on genes, birthweight, gestational age, drugs in the bloodstream (either taken by the mother before birth or given during birth), and many other factors. Thus, anoxia is part of a cascade of factors that may cause cerebral palsy. Almost every birth complication is the result of a similar cascade.

cerebral palsy A disorder that results from damage to the brain's motor centers. People with cerebral palsy have difficulty with muscle control, so their speech and/or body movements are impaired.

anoxia A lack of oxygen that, if prolonged, can cause brain damage or death.

John looked surprised. "I never said I was going to decide anything," he protested. "It's just that if the tests show something wrong with the baby, of course we'll abort. We've talked about this."

"What we've talked about," I told John in a low, dangerous voice, "is that I am pro-choice. That means I decide whether or not I'd abort a baby with a birth defect. . . . I'm not so sure of this."

"You used to be," said John.

"I know I used to be." I rubbed my eyes. I felt terribly confused. "But now . . . look, John, it's not as though we're deciding whether or not to have a baby. We're deciding what *kind* of baby we're willing to accept. If it's perfect in every way, we keep it. If it doesn't fit the right specifications, whoosh! Out it goes."...

John was looking more and more confused. "Martha, why are you on this soapbox? What's your point?"

"My point is," I said, "that I'm trying to get you to tell me what you think constitutes a 'defective' baby. What about . . . oh, I don't know, a hyperactive baby? Or an ugly one?"

"They can't test for those things and—"

"Well, what if they could?" I said. "Medicine can do all kinds of magical tricks these days. Pretty soon we're going to be aborting babies because they have the gene for alcoholism, or homosexuality, or manic depression. . . . Did you know that in China they abort a lot of fetuses just because they're female?" I growled. "Is being a girl 'defective' enough for you?"

"Look," he said, "I know I can't always see things from your perspective. And I'm sorry about that. But the way I see it, if a baby is going to be deformed or something, abortion is a way to keep everyone from suffering—*especially* the baby. It's like shooting a horse that's broken its leg. . . . A lame horse dies slowly, you know? . . . It dies in terrible pain. And it can't run anymore. So it can't enjoy life even if it doesn't die. Horses live to run; that's what they do. If a baby is born not being able to do what other people do, I think it's better not to prolong its suffering."

". . . And what is it," I said softly, more to myself than to John, "what is it that people do? What do we live to do, the way a horse lives to run?"

[Beck, 1999, pp. 132–133, 135]

The second AFP test was in the normal range, "meaning there was no reason to fear . . . Down syndrome" (p. 137).

As you read in Chapter 3, genetic counselors help couples discuss their choices *before* becoming pregnant. John and Martha had had no counseling because the pregnancy was unplanned and their risk for Down syndrome was low. The opposite of a false positive is a *false negative*, a mistaken assurance that all is well. Amniocentesis later revealed that the second AFP was a false negative. Their fetus had Down syndrome after all.

Response for Social Workers (from page 120): Testing and then treatment are useful at any time because women who know they are HIV-positive are more likely to get treatment, reduce the risk of transmission, or avoid pregnancy. If pregnancy does occur, early diagnosis is best. Getting tested after birth is too late for the baby.

SUMMING UP Risk analysis is complex but necessary to protect every fetus. Many factors reduce risk, including the mother's health and nourishment before pregnancy, her early prenatal care and drug use, and the father's support. Each teratogen may harm the fetus, although, as risk analysis implies, the impact varies from none at all to very serious. The timing of exposure, the amount of toxin ingested, and the genes of the mother and fetus are crucial factors.

WHAT HAVE YOU LEARNED?

1. Why is risk analysis more crucial than targeting any one teratogen?
2. When are teratogens most harmful to the future baby?
3. Why is it difficult to pin down the impact of behavioral teratogens?
4. What is a specific example of the impact of genes on birth defects?
5. How do doctors protect the fetus, and when might a doctor do harm?
6. How do anoxia and cerebral palsy illustrate the need for risk analysis?

Low Birthweight: Causes and Consequences

Some newborns are small and immature. With modern hospital care, tiny infants usually survive, but it would be better for everyone—mother, father, baby, and society—if all fetuses developed for at least 35 weeks and all newborns weighed more than 2,500 grams (5½ pounds). (Usually, this text gives pounds before grams, but hospitals worldwide report birthweight using the metric system, so grams precede pounds and ounces here.)

low birthweight (LBW) A body weight at birth of less than 5½ pounds (2,500 grams).

very low birthweight (VLBW) A body weight at birth of less than 3 pounds, 5 ounces (1,500 grams).

extremely low birthweight (ELBW) A body weight at birth of less than 2 pounds, 3 ounces (1,000 grams).

preterm A birth that occurs 3 or more weeks before the full 38 weeks of the typical pregnancy—that is, at 35 or fewer weeks after conception.

small for gestational age (SGA) (Also called *small-for-dates*.) A term for a baby whose birthweight is significantly lower than expected, given the time since conception. For example, a 5-pound (2,265-gram) newborn is considered SGA if born on time but not SGA if born two months early.

The World Health Organization defines **low birthweight (LBW)** as under 2,500 grams. LBW babies are further grouped into **very low birthweight (VLBW),** under 1,500 grams (3 pounds, 5 ounces), and **extremely low birthweight (ELBW),** under 1,000 grams (2 pounds, 3 ounces). It is possible for a newborn to weigh as little as 500 grams, and they are the most vulnerable—about half of them die even with excellent care (Lau et al., 2013).

Remember that fetal weight normally doubles in the last trimester of pregnancy, with 900 grams (about 2 pounds) of that gain occurring in the final three weeks. Thus, a baby born **preterm** (three or more weeks early; no longer called *premature*) is usually, but not always, LBW. In addition, some fetuses gain weight slowly throughout pregnancy and are *small-for-dates*, or **small for gestational age (SGA).** A full-term baby weighing only 2,600 grams and a 30-week-old fetus weighing only 1,000 grams are both SGA, even though the first is not technically low birthweight.

Mothers and Small Babies

Maternal or fetal illness might cause SGA, but maternal drug use is a more common cause. Every psychoactive drug slows fetal growth, with tobacco implicated in 25 percent of all low-birthweight births worldwide.

Another common reason for slow fetal growth as well as preterm birth is malnutrition. Women who begin pregnancy underweight, who eat poorly during pregnancy, or who gain less than 3 pounds (1.3 kilograms) per month in the last six months more often have underweight infants.

Unfortunately, many risk factors—underweight, undereating, underage, and smoking—tend to occur together. To make it worse, many such mothers live in poor neighborhoods, where pollution is high—another risk factor for low birthweight (Stieb et al., 2012).

What About the Father?

The causes of low birthweight just mentioned rightly focus on the pregnant woman. However, fathers—and grandmothers, neighbors, and communities—are often crucial. As an editorial in a journal for obstetricians explains: "Fathers' attitudes regarding the pregnancy, fathers' behaviors during the prenatal period, and the relationship between fathers and mothers . . . may indirectly influence risk for adverse birth outcomes" (Misra et al., 2010, p. 99).

As already explained in Chapter 1, each person is embedded in a social network. Since the future mother's behavior impacts the fetus, everyone who affects her also affects the fetus. She may be stressed because of her boss, her mother, her mother-in-law, and especially her partner. One example is that unintended pregnancies increase the incidence of low birthweight (Shah et al., 2011).

Not only fathers but also the entire social network and culture are crucial (Lewallen, 2011). This is most apparent in what is called the **immigrant paradox.** Many immigrants have difficulty getting education and well-paid jobs; their socioeconomic status is low. Low SES correlates with low birthweight. Thus, newborns born to immigrants are expected to be underweight. But, paradoxically, they are generally healthier in every way, including birthweight, than newborns of U.S.-born women of the same gene pool (García Coll & Marks, 2012).

immigrant paradox The surprising, paradoxical fact that low SES immigrant women tend to have fewer birth complications than native-born peers with higher incomes.

This paradox was first called the *Hispanic paradox*, because, although U.S. residents born in Mexico or South America average lower SES than people of Hispanic descent born in the United States, their newborns have fewer problems. The same discrepancy has now been demonstrated for immigrants from the Caribbean, Africa, Eastern Europe, and Asia. Why? The crucial factor may be fathers and grandmothers, who keep pregnant immigrant women drug-free and healthy, counteracting the stress of poverty (Luecken et al., 2013).

Consequences of Low Birthweight

You have already read that life itself is uncertain for the smallest newborns. Ranking worse than most developed nations—and just behind Cuba and Croatia—the infant mortality rate (death in the first year) of the United States is 34th in the world, about 6 deaths per 1,000 live births, according to the United Nations. The main reason is that the United States has more extremely low-birthweight newborns (Lau et al., 2013).

For survivors born very low birthweight, every developmental milestone—smiling, holding a bottle, walking, talking—is later. Low-birthweight babies experience cognitive difficulties as well as visual and hearing impairments. High-risk newborns become infants and children who cry more, pay attention less, disobey, and experience language delays (Aarnoudse-Moens et al., 2009; Stolt et al., 2014).

Longitudinal research from many nations finds that children who were at the extremes of SGA or preterm have many neurological problems in middle childhood, including smaller brain volume, lower IQs, and behavioral difficulties (Clark et al., 2013; Hutchinson et al., 2013; van Soelen et al., 2010). Even in adulthood, risks persist: Adults who were LBW are more likely to develop diabetes and heart disease, partly because they are more often obese.

Longitudinal data provide both hope and caution. Remember that risk analysis gives probabilities, not certainties—averages are not true in every case. By age 4, some ELBW infants are normal in brain and body.

Comparing Nations

In some northern European nations, only 4 percent of newborns weigh under 2,500 grams; in several South Asian nations, including India, Pakistan, and the

Philippines, more than 20 percent do. Worldwide, far fewer low-birthweight babies are born than two decades ago; as a result, neonatal deaths have been reduced by one-third (Rajaratnam et al., 2010).

Some nations, China and Bangladesh among them, have improved markedly. In 1970, an estimated half of Chinese newborns were LBW; recent estimates put that number at 6 percent (Chen et al., 2013). In 1990, half of newborns in Bangladesh were LBW (World Bank, 1994, p. 214); now the rate is 22 percent (UNICEF, 2014). In some nations, community health programs aid the growth of the fetus. That has an effect, according to a study provocatively titled *Low birth weight outcomes: Why better in Cuba than Alabama?* (Neggers & Crowe, 2013).

In some nations, notably in sub-Saharan Africa, the LBW rate is rising because global warming, HIV, food shortages, wars, and other problems affect pregnancy. Another nation with a troubling rate of LBW is the United States, where the rate fell throughout most of the twentieth century, reaching a low of 7.0 percent in 1990. But then it rose again, with the 2012 rate at 7.99 percent, ranging from under 6 percent in Alaska to over 12 percent in Mississippi. The U.S. rate is higher than that of virtually every other developed nation (see Figure 4.7 for a sampling).

Many scientists have developed hypotheses to explain the U.S. rates. One logical possibility is assisted reproduction, since ART often leads to low-birthweight twins and triplets. However, LBW rates rose for naturally conceived babies as well, so ART cannot be the only explanation.

Added to the puzzle is the fact that several changes in maternal ethnicity, age, and health since 1990 should have decreased LBW, not increased it. For example, African Americans have LBW newborns much more often than the national average (almost 13.2 percent compared with 8 percent), and younger teenagers have smaller babies than do women in their 20s. However, since 1990 the birth rate among both groups has decreased markedly, so average LBW should decrease, not increase. Furthermore, maternal obesity and diabetes have increased since 1990; both lead to heavier babies. Nonetheless, more underweight babies are born.

Something must be amiss. One possibility is nutrition. Nations with many small newborns are also nations where hunger is prevalent. In both Chile and China, LBW fell as nutrition improved.

As for the United States, the U.S. Department of Agriculture (2014) reports an increase in the rate of *food insecurity* (measured by skipped meals, use of food stamps, and outright hunger) between the first 7 years of the twenty-first century and the next 7, from about 11 percent to about 15 percent. Hunger directly affects LBW, and food insecurity

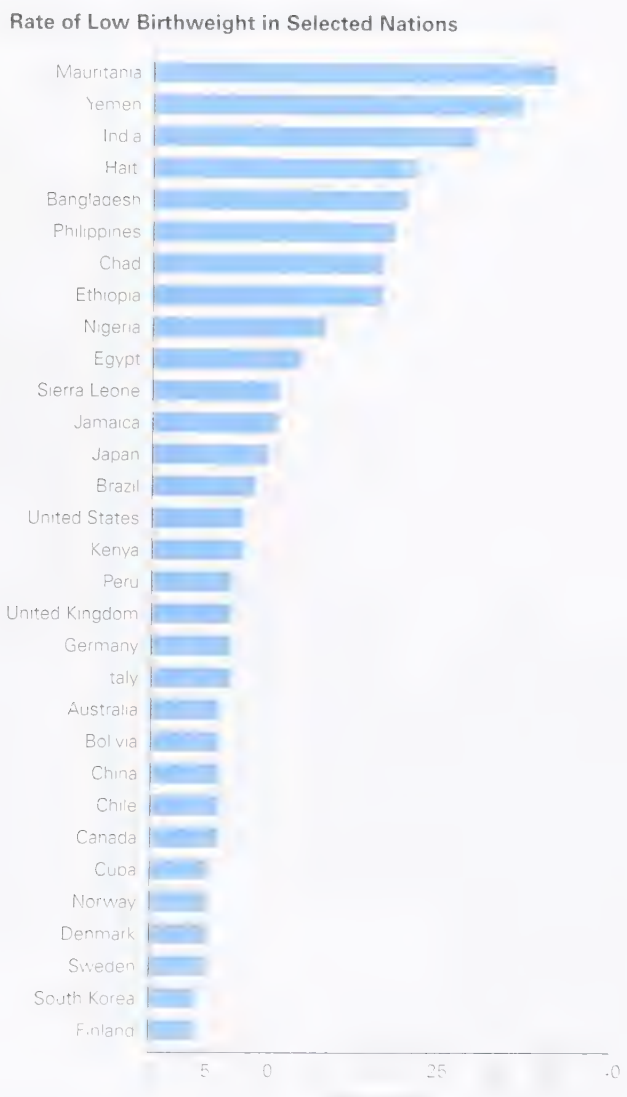


FIGURE 4.7

Getting Better Some public health experts consider the rate of low birthweight to be indicative of national health, since both are affected by the same causes. If that is true, the world is getting healthier, since the LBW world average was 28 percent in 2009 but 16 percent in 2012. When all nations are included, 47 report LBW at 6 percent or less (United States and United Kingdom are not among them).

also increases chronic illness, which itself correlates with LBW (Seligman & Schillinger, 2010). Food insecurity rates are higher among women in their prime reproductive years than among middle-aged women or men of any age, and highest of all among single women with children.

Another possibility is drug use. For example, the rate of smoking and drinking among high school girls reached a low in 1992, then increased, then decreased. Most U.S. women giving birth in the first decade of the twenty-first century are in a cohort that experienced rising drug use when they were younger; they may still suffer the effects. If that is the reason, the recent decrease in drug use among teenagers will result in fewer LBW babies soon.



© IMAGES ALAMY

A Growing Trend The rate of first births to women in their 40s tripled from 1990 to 2008, although most newborns (96%) have mothers under age 40. Nonetheless, prenatal testing and medical advances have made late motherhood less risky than it was, with some happy results. This mother is 42.

Another possible cause of LBW is pollution. Air pollution is decreasing in the United States. If pollution is the cause, fewer LBW babies will be born. On the other hand, many chemicals are more common in the maternal blood stream than they were. Looking at food, drug, pollution, and chemical trends in various nations will help developmentalists understand how to prevent LBW in the future.

SUMMING UP Low birthweight, either because of slow prenatal growth or preterm birth, increases vulnerability and may slow down development lifelong. Causes are many, from drug use to hunger, and vary markedly from nation to nation. The birth process itself can worsen the effects of any prenatal risk, with the smallest newborns at particular risk for early death or lifetime impairment. In general, low SES increases the risk for low birthweight, but some international data as well as the immigrant paradox suggest that it is not simply poverty that causes underweight newborns.

WHAT HAVE YOU LEARNED?

1. What are the differences among LBW, VLBW, and ELBW?
2. What are four reasons a baby might be born LBW?
3. What are the national and international trends in low birthweight?
4. How might the father's role be one reason for immigration paradox?
5. What is the prediction for the future of an ELBW newborn who survives?

LaunchPad



COURTESY OF UNICEF

Watch **Video: Low Birthweight in India,** which discusses the causes of low birthweight among babies in India.

The New Family

Humans are social creatures, seeking interaction with their families and their societies. We have already seen how crucial social support is during pregnancy; social interaction may become even more important once the child is born.

The Newborn

Before birth, developing humans already affect their families through fetal movements and hormones that trigger maternal nurturance (food aversions, increased

VISUALIZING DEVELOPMENT

A Healthy Newborn

Just moments after birth, babies are administered their very first test. The APGAR score is an assessement tool used by doctors and nurses to determine whether a newborn requires any medical intervention. It tests five specific criteria of health, and the medical professional assigns a score of 0, 1, or 2 for each category. A perfect score of 10 is rare—most babies will show some minor deficits at the 1 minute mark, and many will still lose points at the 5 minute mark.

GRIMACE RESPONSE/REFLEXES

(2) A healthy baby will indicate his displeasure when his airways are suctioned—he'll grimace, pull away, cough, or sneeze.

(1) Baby will grimace during suctioning.

(0) Baby shows no response to being suctioned and requires immediate medical attention.

RESPIRATION

(2) A good strong cry indicates a normal breathing rate.

(1) Baby has a weak cry or whimper, or slow/irregular breathing.

(0) Baby is not breathing and requires immediate medical intervention.



PULSE

(2) A pulse of 100 or more beats per minute is healthy for a newborn.

(1) Baby's pulse is less than 100 beats per minute.

(0) A baby with no heartbeat requires immediate medical attention.

APPEARANCE/COLOR

(2) Body and extremities should show good color, with pink undertones indicating good circulation.

(1) Baby has some blueness in the palms and soles of the feet. Many babies exhibit some blueness at both the 1 and 5 minute mark; most warm up soon after.

(0) A baby whose entire body is blue, grey, or very pale requires immediate medical intervention.

ACTIVITY AND MUSCLE TONE

(2) Baby exhibits active motion of arms, legs, body.

(1) Baby shows some movement of arms and legs.

(0) A baby who is limp and motionless requires immediate medical attention.

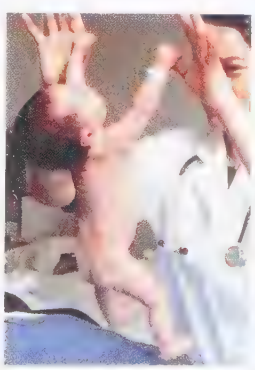
REFLEXES IN INFANTS

Never underestimate the power of a reflex. For developmentalists, newborn reflexes are mechanisms for survival, indicators of brain maturation, and vestiges of evolutionary history. For parents, they are mostly delightful and sometimes amazing.



THE SUCKING REFLEX A newborn just a few minutes old delights

ASTIER, BSIP/SCIENCE SOURCE, PHOTO RESEARCHERS, INC



THE GRASPING REFLEX When the doctor places a finger in the palm of a healthy infant, [illegible] will grasp so tightly that the baby's

PETIT FORMAT, PHOTO RESEARCHERS



THE STEP REFLEX A one-day-old girl steps eagerly forward long on legs too tiny to support her body

JENNIE WOODCOCK, REFLECTIONS PHOTOLIBRARY/CORBIS

CENTER IMAGE: SEKUNDATOR/SHUTTERSTOCK

• REDITS LISTED ON P. 521

sleep, and more). At birth, a newborn's appearance (big hairless head, tiny toes, and so on) stirs the human heart, evident in adults' brain activity and heart rate. Fathers are often enraptured by their scraggly newborn and protective of the exhausted mothers, who may appreciate their husbands more than before, for hormonal as well as practical reasons.

Newborns are likewise responsive social creatures in the first hours of life (Zeifman, 2013). They listen, stare, cry, stop crying, and cuddle. In the first day or two, a professional might administer the **Brazelton Neonatal Behavioral Assessment Scale (NBAS),** which records 46 behaviors, including 20 reflexes. Parents who watch the NBAS are often amazed—and this fosters early parent–child connection (Hawthorne, 2009).

Brazelton Neonatal Behavioral Assessment Scale (NBAS) A test often administered to newborns that measures responsiveness and records 46 behaviors, including 20 reflexes.

Technically, a **reflex** is an involuntary response to a particular stimulus. Humans of every age instinctively protect themselves (the eye blink is an example). That definition makes reflexes seem automatic. Not quite true. Actually, the strength and reliability of newborn reflexes varies depending on genes, drugs in the bloodstream, and overall health. (See Visualizing Development, p. 126.)

reflex An unlearned, involuntary action or movement in response to a stimulus. A reflex occurs without conscious thought.

- *Reflexes that maintain oxygen supply.* The *breathing reflex* begins even before the umbilical cord, with its supply of oxygen, is cut. Additional reflexes that maintain oxygen are reflexive *hiccups* and *sneezes,* as well as *thrashing* (moving the arms and legs about) to escape something that covers the face.
- *Reflexes that maintain constant body temperature.* When infants are cold, they *cry, shiver,* and *tuck their legs* close to their bodies. When they are hot, they try to *push away* blankets and then stay still.
- *Reflexes that manage feeding.* The *sucking reflex* causes newborns to suck anything that touches their lips—fingers, toes, blankets, and rattles, as well as natural and artificial nipples of various textures and shapes. In the *rooting reflex,* babies turn their mouths toward anything that brushes against their cheeks—a reflexive search for a nipple—and start to suck. *Swallowing* also aids feeding, as does *crying* when the stomach is empty and *spitting up* when too much is swallowed quickly.

Other reflexes are not necessary for survival but signify the state of brain and body functions. Among them are the:

- *Babinski reflex.* When a newborn's feet are stroked, the toes fan upward.
- *Stepping reflex.* When newborns are held upright, feet touching a flat surface, they move their legs as if to walk.
- *Swimming reflex.* When held horizontally on their stomachs, newborns stretch out their arms and legs.
- *Palmar grasping reflex.* When something touches newborns' palms, they grip it tightly.
- *Moro reflex.* When someone bangs on the table they are lying on, newborns fling their arms outward and then bring them together on their chests, crying with wide-open eyes.

These reflexes are responses to experiences, not unlike an adult's sudden fear, or lust, or anger.

The senses are also responsive: New babies listen more to voices than to traffic, for instance. Thus, in many ways, newborns connect with the people of their world, who are predisposed to respond (Zeifman, 2013). If the baby performing these actions on the Brazelton NBAS were your own, you would be proud and amazed; that is part of being human.

LaunchPad



NINA ASTAKHOVA SHUTTERSTOCK

Video: Newborn Reflexes shows several infants displaying the reflexes discussed in this section.

New Mothers

About half of all women experience significant physical problems soon after birth, such as healing from a c-section, painfully sore nipples, or problems with urination (Danel et al., 2003). However, worse than any of these physical problems are psychological ones. When the level of birth hormones decreases, between 8 and 15 percent of women experience **postpartum depression,** a sense of inadequacy and sadness (called *baby blues* in the mild version and *postpartum psychosis* in the most severe form) (Perfetti et al., 2004).

postpartum depression A new mother's feelings of inadequacy and sadness in the days and weeks after giving birth.

With postpartum depression, baby care (feeding, diapering, bathing) feels very burdensome. The newborn's cry may not compel the mother to carry and nurse her infant. Instead, the mother may have thoughts of neglecting or abusing the infant, thoughts so terrifying that she is afraid of herself.

The first sign that something is amiss may be euphoria after birth. A new mother may be unable to sleep, or to stop talking, or to push aside irrational worries. Some of this behavior is normal, but family members and medical personnel need to be alert to the mother's emotions. After the initial high, severe depression may set in, with a long-term impact on the child.

Especially for Nurses in Obstetrics Can the father be of any practical help in the birth process? (see response, page 130)

But postpartum depression is not due to hormonal changes alone. From a developmental perspective, some causes of postpartum depression (such as financial stress) predate the pregnancy; others (such as marital problems) occur during pregnancy; others correlate with birth (especially if the mother is alone and imagined a different birth than actually occurred); and still others are specific to the particular infant (such as health, feeding, or sleeping problems). Successful breast-feeding mitigates maternal depression (Figueiredo et al., 2014), one of the many reasons a lactation consultant is an important part of the new mother's support team.



Expecting a Girl She is obviously thrilled and ready, and they bought a crib, but he seems somewhat nervous. Perhaps someone should tell him that his involvement will help his newborn become a happy and accomplished child and adult, a source of paternal pride and joy for the next forty years or more.

New Fathers

As we have seen, fathers-to-be help mothers-to-be stay healthy, nourished, and drug-free. The father's role in birth may also be crucial.

Being There

At birth, the father's presence reduces complications, in part because he reassures his wife. I observed this when my daughter, Elissa, birthed Asa (now 5, as noted in the opening of this chapter). Asa's birth took much longer than his younger brother's; Elissa's anxiety rose when the doctor and midwife discussed a possible cesarean for "failure to progress" without asking her opinion. Her husband told her, "All you need to do is relax between contractions and push when a contraction comes. I will do the rest." She listened. He did. No cesarean.

Whether or not he is present at the birth, the father's legal acceptance of the birth is important to mother and

newborn. A study of all live, single births in Milwaukee from 1993 to 2006 (151,869 babies!) found that complications correlated with several expected variables (e.g., maternal cigarette smoking) and one unexpected one—no father listed on the birth record. This connection was especially apparent for European Americans: When the mother did not list the father, rates of long labor, cesarean section, and other complications increased (Ngui et al., 2009).

Currently, about half of all U.S. women are not married when their baby is born (Monte & Ellis, 2014), but fathers are usually listed. When fathers acknowledge their role, birth is better for mother and child.

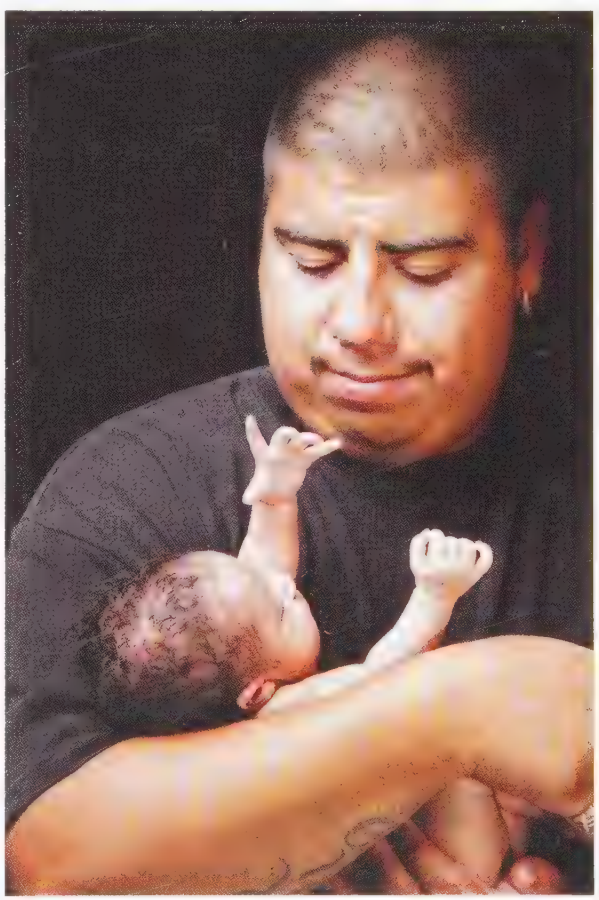
Couvade

Fathers may experience pregnancy and birth biologically, not just psychologically with stress, worry, and so on. Many fathers have symptoms of pregnancy and birth, including weight gain and indigestion during pregnancy and pain during labor (Leavitt, 2009). Among the Papua in New Guinea and the Basques in Spain, husbands used to build a hut when birth was imminent and then lie down to writhe in mock labor (Klein, 1991).

couvade Symptoms of pregnancy and birth experienced by fathers

Paternal experiences of pregnancy and birth are called **couvade**—expected in some cultures, normal in many, and considered pathological in others (M. Sloan, 2009). A recent study in India found that most new fathers experienced couvade (Ganapathy, 2014). In the United States, couvade is unnoticed and unstudied, but many fathers are intensely involved with their future child (Brennan et al., 2007; Raeburn, 2014).

Fathers are usually the first responders when the mother experiences postpartum depression; they may be instrumental in getting the support the mother and baby need (Cuijpers et al., 2010; Goodman & Gotlib, 2002). But fathers are vulnerable to depression, too; other people need to help. Indeed, sometimes the father experiences more problems than the mother (Bradley & Slade, 2011).



NATHAN ALFRED ALAM

Mutual Joy Ignore this dad's tattoo and earring, and the newborn's head wet with amniotic fluid. Instead recognize that, for thousands of years, hormones and instincts propel fathers and babies to reach out to each other, developing lifelong connections.

Parental Alliance

Remember John and Martha, the young couple whose amniocentesis revealed that their fetus had trisomy-21 (Down syndrome)? One night at 3:00 A.M., after about seven months of pregnancy, Martha was crying uncontrollably. She told John she was scared.

> "Scared of what?" he said. "Of a little baby who's not as perfect as you think he ought to be?"

Response for Nurses in Obstetrics (from page 128): Usually not, unless he is experienced, well taught, or has expert guidance. But his presence provides emotional support for the woman, which makes the birth process easier and healthier for mother and baby.

"I didn't say I wanted him to be perfect," I said. "I just want him to be normal. That's all I want. Just normal."

"That is total bullshit. . . . You don't want this baby to be normal. You'd throw him in a dumpster if he just turned out to be normal. What you really want is for him to be superhuman."

"For your information," I said in my most acid tone, "I was the one who decided to keep this baby, even though he's got Down's. You were the one who wanted to throw him in a dumpster."

"How would you know?" John's voice was still gaining volume. "You never asked me what I wanted, did you? No. You never even asked me."

[Beck, 1999, p. 255]

This episode ended well, with a long, warm, and honest conversation between the two prospective parents. Each learned what their fetus meant to the other, a taboo topic until that night. Adam, their future son, became an important part of their relationship.

Their lack of communication up to this point, and the sudden eruption of unexpressed emotions, is not unusual, because pregnancy itself raises memories from childhood and fears about the future. Yet honest and intimate communication is crucial throughout pregnancy, birth, and child rearing. Such early communication between new parents helps to form a **parental alliance,** a commitment by both parents to cooperate in raising their child.

parental alliance Cooperation between a mother and a father based on their mutual commitment to their children. In a parental alliance, the parents support each other in their shared parental roles.

The parental alliance is especially beneficial when the infant is physically vulnerable, such as having a low birthweight. The converse is also true: Family conflict when a newborn needs extra care increases the risk of child maladjustment and parental divorce (Whiteside-Mansell et al., 2009).

Family Bonding

To what extent are the first hours after birth crucial for the **parent–infant bond,** the strong, loving connection that forms as parents hold, examine, and feed their newborn? It has been claimed that this bond develops in the first hours after birth when a mother touches her naked baby, just as sheep and goats must immediately smell and nuzzle their newborns if they are to nurture them (Klaus & Kennell, 1976).

parent–infant bond The strong, loving connection that forms as parents hold, examine, and feed their newborn.

However, the hypothesis that early skin-to-skin contact is *essential* for human nurturance has been proven false (Eyer, 1992; Lamb, 1982). Substantial research on monkeys begins with *cross-fostering*, a strategy in which newborns are removed from their biological mothers in the first days of life and raised by another female or even a male. A strong and beneficial relationship sometimes develops (Suomi, 2002).

This finding does not contradict the generalization that prospective parents' active involvement in pregnancy, birth, and care of the newborn benefits all three. Factors that encourage parents (biological or adoptive) to nurture their newborns may have lifelong benefits (Champagne & Curley, 2010).

The role of early contact has become apparent with **kangaroo care,** in which the newborn lies between the mother's breasts, skin-to-skin, listening to her heartbeat and feeling her body heat. Many studies find that kangaroo-care newborns sleep more deeply, gain weight more quickly, and spend more time alert than do infants with standard care (Feldman et al., 2002; Ferber & Makhoul, 2004; Gathwala et al., 2010). Father involvement may also be important, including father–infant kangaroo care (Feeley et al., 2013).

kangaroo care A form of newborn care in which mothers (and sometimes fathers) rest their babies on their naked chests, like kangaroo mothers that carry their immature newborns in a pouch on their abdomen.



REUTERS/ROLEX DELA PENA/PA NEWSCOM

Better Care Kangaroo care benefits mothers, babies, and hospitals, saving space and medical costs in this ward in Manila. Kangaroo care is one reason Filipino infant mortality in 2010 is only one fifth of what it was in 1950.

Kangaroo care benefits babies, not only in the hospital but months later, either because of improved infant adjustment to life outside the womb or because of increased parental sensitivity and effectiveness. Which of these two is the explanation? Probably both.

Implementation of many strategies, especially for fragile infants and their parents, is especially needed in developing nations, where kangaroo care and other measures could reduce deaths by 20 to 40 percent (Bhutta et al., 2008). From a developmental perspective, the most difficult time for high-risk infants occurs when they leave the hospital, days or weeks after birth. At this juncture, measures to involve parents in early care are crucial. As we will see in later chapters, the relationship between parent and child develops over months and years, not merely hours. Birth is one step of a lifelong journey.

SUMMING UP Every member of the new family contributes to their shared connection, enabling them all to thrive. The new baby has responsive senses and many reflexes. Close observation and reflection reveal how much the new baby can do. The father's support increases the likelihood of a healthy, happy newborn and mother. Postpartum depression of the mother is not rare; factors before and after birth affect how serious and long-lasting it is. Family relationships begin before conception, may be strengthened throughout pregnancy and birth, and continue throughout the life span. Bonding at birth is facilitated by early contact between mother, father, and baby, and kangaroo care benefits the baby, but neither are essential for a close parental alliance or for a healthy parent–infant relationship.

WHAT HAVE YOU LEARNED?

1. What do newborns do to aid their survival?
2. What impact do fathers have during and after birth?
3. How do fathers experience pregnancy?
4. What are the signs of postpartum depression?
5. What affects the parent–infant bond?
6. What are the results of kangaroo care?

SUMMARY

Prenatal Development

1. The first two weeks of prenatal growth are called the germinal period. During this time, the single-celled zygote multiplies into more than 100 cells that will eventually form both the placenta and the embryo. The growing organism travels down the fallopian tube to implant in the uterus.
2. The third through eighth weeks after conception make up the embryonic period. The heart begins to beat, and the eyes, ears, nose, and mouth form, the skeletal outline and inner organs form. By the eighth week, the embryo has the basic organs and features of a human, with the exception of the sex organs.
3. The fetal period extends from the ninth week until birth. In the ninth week, the sexual organs develop. By the end of the third month, all the organs and body structures have formed. The fetus attains viability at 22 weeks, when the brain can regulate basic body functions.
4. The average fetus gains approximately 4½ pounds (2,040 grams) from the 6th to the 9th month, weighing 7½ pounds (3,400 grams) at birth. Maturation of brain, lungs, and heart ensures survival of more than 99 percent of all full-term babies born in developed nations.

Birth

5. Birth typically begins with contractions that push the fetus out of the uterus and then through the vagina. The Apgar scale, which rates the newborn at one minute and again at five minutes after birth, provides a quick evaluation of the infant's health.
6. Medical assistance can speed contractions, dull pain, and save lives. However, many aspects of medicalized birth have been criticized as impersonal and unnecessary, including about half the cesareans performed in the United States. Contemporary birthing practices—such a birthing centers and, especially in some European nation, home births—are aimed at finding a balance—protecting the baby but also allowing more parental involvement and control.

Harm to the Fetus

7. Risk analysis is crucial in predicting prenatal development, because no teratogen always causes harm, but many factors affect whether harm will occur and how serious it will be.
8. Some teratogens (diseases, drugs, and pollutants) cause physical impairment, especially during the first weeks of development. Others, called behavioral teratogens, harm the fetal brain and therefore, in later life, impair cognitive abilities and affect personality.
9. Whether a teratogen harms an embryo or fetus depends on timing, dose, and genes. Public and personal health practices can protect against prenatal complications. Support and help from the father and other family members affect the pregnant woman's health.
10. Birth complications, such as unusually long and stressful labor that includes anoxia (a lack of oxygen to the fetus), have many causes, and are made worse by teratogens and other prenatal factors.

Low Birthweight: Causes and Consequences

11. Low birthweight (under 5½ pounds, or 2,500 grams), very low birthweight (VLBW—under 1500 grams), and extremely low birthweight (ELBW under 1000 grams) may arise from multiple births, placental problems, maternal illness, malnutrition, smoking, drinking, illicit drug use, and age.
12. Compared with full-term, normal weight newborns, preterm and underweight babies experience more medical difficulties and psychological problems for many years. Babies that are small for gestational age (SGA) are especially vulnerable.
13. National differences are apparent in the frequency of low birth weight, primarily because of undernourished mothers. In addition, family support may be crucial, and may be one reason for the immigration paradox, that in developed nations, women born in other nations are more likely to have full term newborns than native-born women.

The New Family

14. Humans are social animals, from the moment of birth. The Brazelton Neonatal Behavioral Assessment Scale measures 46 newborn behaviors, 20 of which are reflexes. In many ways newborns contribute to early family bonding.
15. Fathers can be supportive during pregnancy as well as helpful in birth. Paternal support correlates with shorter labor and fewer complications. Some fathers become so involved with the pregnancy and birth that they experience couvade.
16. Many women feel unhappy, incompetent, or unwell after giving birth. This may reach the level of postpartum depression. Fathers may have a crucial influence on the health and welfare of mother and child. Ideally, a parental alliance forms to help the child develop well.
17. Kangaroo care benefits all babies but especially those who are vulnerable. Mother–newborn interaction should be encouraged, although the parent–infant bond depends on many factors in addition to birth practices.

KEY TERMS

germinal period (p. 100)
embryonic period (p. 100)
fetal period (p. 100)
implantation (p. 101)
embryo (p. 102)
fetus (p. 102)
ultrasound (p. 103)
age of viability (p. 103)
Apgar scale (p. 107)
cesarean section (c-section) (p. 108)
doula (p. 111)
teratogen (p. 112)
behavioral teratogens (p. 112)
threshold effect (p. 113)
fetal alcohol syndrome (FAS) (p. 114)
false positive (p. 120)
cerebral palsy (p. 121)
anoxia (p. 121)
low birthweight (LBW) (p. 122)
very low birthweight (VLBW) (p. 122)
extremely low birthweight (ELBW) (p. 122)
preterm (p. 122)
small for gestational age (SGA) (p. 122)
immigrant paradox (p. 123)
Brazelton Neonatal Behavioral Assessment Scale (NBAS) (p. 127)
reflex (p. 127)
postpartum depression (p. 128)
couvade (p. 129)
parental alliance (p. 130)
parent–infant bond (p. 130)
kangaroo care (p. 130)

APPLICATIONS

1. Go to a nearby greeting-card store and analyze the cards about pregnancy and birth. Do you see any cultural attitudes (e.g., variations depending on the sex of the newborn or of the parent)? If possible, compare those cards with cards from a store that caters to another economic or ethnic group.
2. Interview three mothers of varied backgrounds about their birth experiences. Make your interviews open-ended—let them choose what to tell you, as long as they give at least a 10-minute description. Then compare and contrast the three accounts, noting especially any influences of culture, personality, circumstances, and cohort.
3. People sometimes wonder how any pregnant woman could jeopardize the health of her fetus. Consider your own health-related behavior in the past month—exercise, sleep, nutrition, drug use, medical and dental care, disease avoidance, and so on. Would you change your behavior if you were pregnant? Would it make a difference if you, your family, and your partner did not want a baby?



LEFT: © 2016 MACMILLAN

PART 2

the first two years

Adults don't change much in a year or two. They might have longer, grayer, or thinner hair; they might gain or lose weight; they might learn something new. But if you saw friends you hadn't seen for a few years, you'd recognize them immediately.

Imagine caring for a newborn 24/7 for a month and then leaving for two years. On your return, you might not recognize him or her. The baby would have quadrupled in weight, grown a foot taller, and sprouted a new head of hair. Behavior and emotions change, too—less crying, but new laughter and fear—including fear of you.

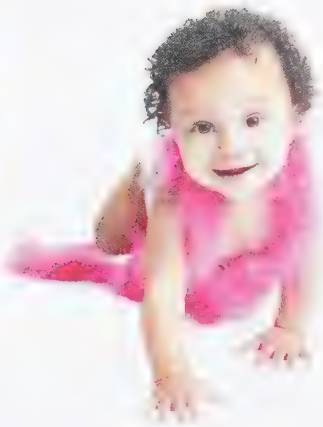


A year or two is not much compared with the 80 or so years of the average life. However, in their first two years, humans reach half their adult height, learn to talk in sentences, and express almost every emotion—not just joy and fear but also love, jealousy, and shame. Invisible changes in the brain are even more crucial, setting the pattern for the life span. The next three chapters describe these radical and awesome changes.



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CHAPTER 5



The First Two Years: Biosocial Development

1. What part of an infant grows most in the first two years?
2. Does brain wiring in the first two years depend on genes or experience?
3. Which of the five senses develops last: seeing, hearing, tasting, touching, or smelling?
4. What happens if a baby does not get his or her vaccinations?

Our first child, Bethany, was born when I was in graduate school. I memorized developmental norms, including walking and talking at 12 months. In her first year, she babbled and said "mama," but at 14 months, Bethany had not yet taken her first step.

To reassure myself, I told my husband that genes were more influential than anything we did. I had read that babies in Paris are among the latest walkers in the world, and my grandmother was French. To my relief, Bethany soon began walking, and by age 5 she was the fastest runner in her kindergarten. My genetic explanation was bolstered when our next two children, Rachel and Elissa, were also slow to walk. My students with ancestors from Guatemala and Ghana bragged about their infants who walked before a year; those from China and France had later walkers. Genetic, I thought.

Fourteen years after Bethany, Sarah was born. I could afford a full-time caregiver, Mrs. Todd, from Jamaica. She thought Sarah was the most advanced baby she had ever known, except for her own daughter, Gillian. I told her that Berger children walk late.

"She'll be walking by a year," Mrs. Todd told me. "Gillian walked at 10 months."

"We'll see," I graciously replied, confident of my genetic explanation.

I underestimated Mrs. Todd. She bounced my delighted baby on her lap, day after day, and spent hours giving her "walking practice." Sarah took her first step at 12 months—late for a Todd, early for a Berger, and a humbling lesson for me.

As a scientist, I know that a single case proves nothing. My genetic explanation might be valid, especially since Sarah shares only half her genes with Bethany and since my daughters are only one-eighth French, a fraction I had ignored when they were infants.

Nonetheless, I now notice how caretakers influence every aspect of biosocial growth. As you read this chapter, you also will see that caregiving enables babies to grow, move, and learn. Development is not as straightforward and automatic, nor as genetically determined, as it once seemed. Genes provide the outline, but every moment of life after birth shapes and guides the young person to become a distinct, and special, human being.

- Body Changes
  - Body Size
  - Sleep
  - OPPOSING PERSPECTIVES: Where Should Babies Sleep?
- Brain Development
  - Connections in the Brain
  - Experience Shapes the Brain
  - A VIEW FROM SCIENCE: Face Recognition
  - Harming the Infant Brain
  - Implications for Caregivers
- Perceiving and Moving
  - The Senses
  - Motor Skills
  - Cultural Variations
- Surviving in Good Health
  - Better Days Ahead
  - A CASE TO STUDY: Scientist at Work
  - Immunization
  - Nutrition

LaunchPad



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Video: Physical Development in Infancy and Childhood offers a quick review of the physical changes that occur in a child's first two years.

Body Changes

In infancy, growth is so rapid and the consequences of neglect so severe that gains are closely monitored. Medical checkups, including measurement of height, weight, and head circumference, provide the first clues as to whether an infant is progressing as expected—or not.

Body Size

Newborns lose several ounces in the first three days and then gain an ounce a day for months. Birthweight typically doubles by 4 months and triples by a year. On average, a 7-pound newborn will be 21 pounds at 12 months (9,525 grams, up from 3,400 grams grams at birth). Height increases, too: A typical baby grows 10 inches (24 centimeters) in a year.

Physical growth then slows, but not by much. Most 24-month-old children weigh almost 28 pounds (13 kilograms) and have added another 4 inches (10 centimeters) or so. Typically, 2-year-olds are half their adult height and about one-fifth their adult weight, four times heavier than they were at birth (see Figure 5.1).

At each well-baby checkup (monthly at first), growth is compared to the baby's previous numbers. Often, measurements are expressed as a **percentile,** from 0 to 100, that indicates where an individual ranks on a particular measure. Percentiles are often used for school achievement; here they are used to indicate how an infant's growth compares to other babies of the same age.

percentile A point on a ranking scale of 0 to 100. The 50th percentile is the midpoint; half the people in the population being studied rank higher and half rank lower.

failure to thrive A serious medical condition in early infancy, when the baby does not gain weight as rapidly as he or she is expected to.

Thus, a 3-month-old's weight at the 30th percentile means that 30 percent of 3-month-old babies weigh less and 70 percent weigh more. If the percentile were 60, then 60 percent weigh less and 40 percent weigh more. The fact that the first baby is a little smaller and the second a little bigger than average is not a problem, since humans vary on every dimension. Only one baby in a 100 is exactly average, at the 50th percentile.

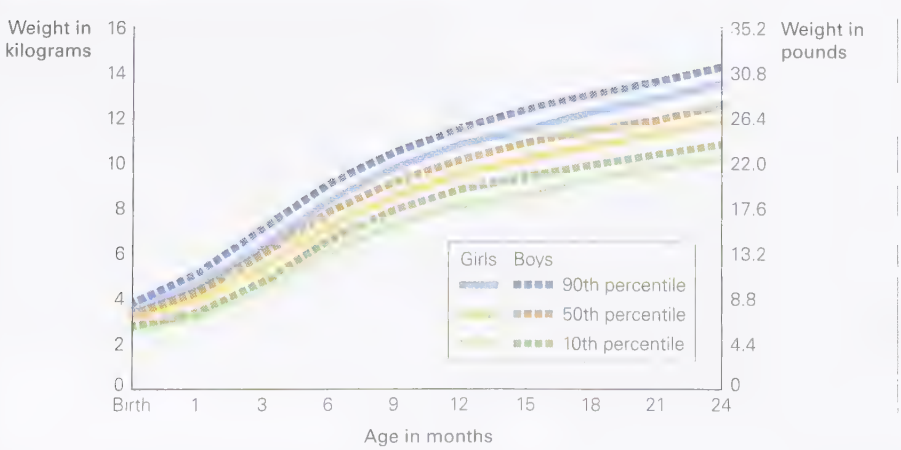
For any baby, however, an early sign of trouble occurs when a percentile moves 20 percent or more, either up or down. If an average baby suddenly grows more slowly, that could be the first sign of a medical condition called **failure to thrive.** If weight gain is accelerated, as when a baby at the 30th percentile is at the 60th percentile a month later, that may signal later obesity.

A dramatic shift in percentile in either direction was once blamed solely on parents. For small babies, it was thought that parents made feeding stressful, leading to "nonorganic failure to thrive." Now dozens of medical conditions have been discovered that cause failure to thrive. Thus, organic causes may impede growth. Pediatricians consider it "outmoded" to blame parents (Jaffe, 2011, p. 100).

FIGURE 5.1

Eat and Sleep The rate of increasing weight in the first weeks of life makes it obvious why new babies need to be fed day and night.

Weight of Girls and Boys, Birth to 24 Months



Sleep

Throughout childhood, regular and ample sleep correlates with normal brain maturation, learning, emotional regulation, academic success, and psychological adjustment (Maski & Kothare, 2013). Lifelong, sleep deprivation can cause poor health, and vice versa. As with many health habits, sleep patterns begin in the first year.







Same Boy, Much Changed All three photos show Conor: first at 3 months, then at 12 months, and finally at 24 months. Note the rapid growth in the first two years, especially apparent in the changing proportions of the head compared to the body and legs.

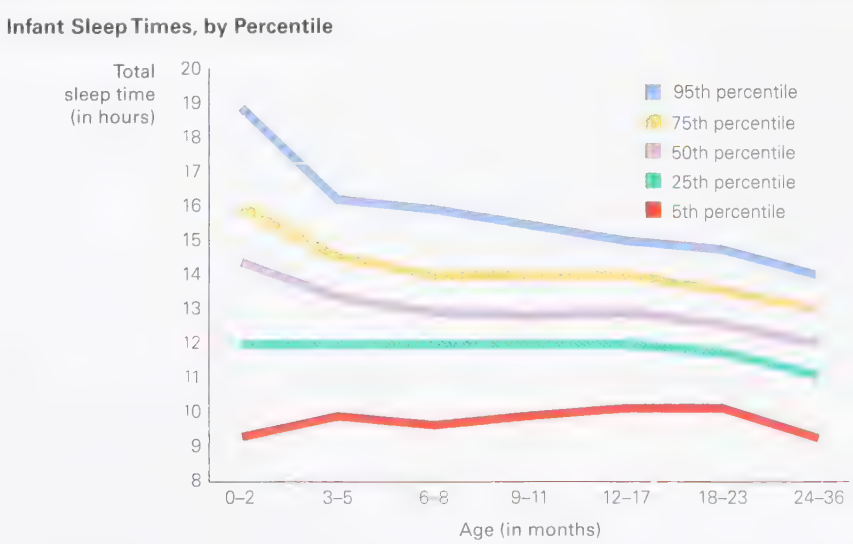
Newborns spend most of their time sleeping, about 15 to 17 hours a day. Hours of sleep decrease rapidly with maturity: The norm per day for the first 2 months is 14¼ hours; for the next 3 months, 13¼ hours; for 6 to 17 months, 12¾ hours. Remember that norms are simply averages. Among every 20 newborns in the United States, parents report that one sleeps only nine hours per day and one sleeps 19 hours (Sadeh et al., 2009) (see Figure 5.2).

Cultural differences are apparent. By age 2, the typical toddler in New Zealand sleeps 15 percent more than the typical Japanese one, 13.3 hours a day compared to 11.6 (Sadeh et al., 2010). Everywhere, full-term newborns sleep more than preterm newborns, who need to eat every two hours.

Infants also vary in how long they sleep at a stretch. If "sleeping through the night" means sleeping from midnight to 5 A.M., half of all babies sleep through the night at least once by 3 months, but if a night is from 10 P.M. to 6 A.M., some 1-year-olds still do not sleep all night long (Russell et al., 2013).

Over the first months, the relative amount of time spent in each type or stage of sleep changes. Babies born preterm may always seem to be dozing. Full-term newborns dream a lot; about half their sleep is **REM sleep** (rapid

REM (rapid eye movement) sleep A stage of sleep characterized by flickering eyes behind closed lids, dreaming, and rapid brain waves.



Source: Sadeh et al., 2009

FIGURE 5.2

Good Night, Moon Average sleep per 24-hour period is given in percentiles because there is much variation in how many hours a young child normally sleeps. Other charts from this study show nighttime sleep and daytime napping. Most 1-year-olds sleep about 10 hours a night, with about 2 hours of napping, but some sleep much less. By age 3, about 10 percent have given up naps altogether. Note that these data are drawn from reports by U.S. parents, based on an Internet questionnaire. Actual sleep monitors or reports by a more diverse group of parents would show even more variation.

eye movement sleep), with flickering eyes and rapid brain waves. That indicates dreaming. REM sleep declines over the early weeks, as does "transitional sleep," the dozing, half-awake stage. At 3 or 4 months, quiet sleep (also called *slow-wave sleep*) increases markedly.

By about 3 months, all the various states of waking and sleeping become more evident. Thus, although newborns often seem half asleep, neither in deep sleep nor wide awake, by 3 months most babies have periods of alertness and periods of deep sleep (when noises do not rouse them).

Sleep varies not only because of biology (age and genes) but also because of caregiver actions. Babies who are fed cow's milk and cereal sleep longer and more soundly—easier for parents but not good for the baby. Social environment matters more directly: If parents respond to predawn cries with food and play, babies learn to wake up early and often, night after night, which may not be good for anyone (Sadeh et al., 2009).

Insufficient sleep may become a serious problem for parents as well as for infants, because "[p]arents are rarely well-prepared for the degree of sleep disruption a newborn infant engenders, and many have unrealistic expectations about

opposing perspectives

Where Should Babies Sleep?

Traditionally, most middle-class U.S. infants slept in cribs in their own rooms; it was feared that they would be traumatized if their parents had sex. By contrast, most infants in Asia, Africa, and Latin America slept near their parents, a practice called **co-sleeping,** and sometimes in their parents' bed, called **bed-sharing.** In those cultures, nighttime parent–child separation was considered cruel.

Even today, at baby's bedtime, Asian and African mothers worry more about separation, whereas European and North American mothers worry more about privacy. A survey found that parents act on these fears: The extremes were 82 percent of Vietnam babies co-sleeping compared with 6 percent in New Zealand (Mindell et al., 2010) (see Figure 5.3). Cohort is also significant. In the United States, bed-sharing doubled from 1993 to 2010, from 6.5 percent to 13.5 percent (Colson et al., 2013).

This difference in practice may seem related to income since low-SES families are less likely to have an extra room and women with less education are more likely to sleep beside their baby (Colson et al., 2013). But even wealthy Japanese families often co-sleep. By contrast, many low-income North American families find a separate bedroom for their children. Co-sleeping results from culture and custom, not merely income, which makes it a difficult practice to change (Ball & Volpe, 2013).

co-sleeping A custom in which parents and their children (usually infants) sleep together in the same room.

bed-sharing When two or more people sleep in the same bed. If one of those people is an infant, some researchers worry that the adult will roll over on the infant.



Source. Mindell et al., 2010.

FIGURE 5.3

Awake at Night Why the disparity between Asian and non-Asian rates of co-sleeping? It may be that Western parents use a variety of gadgets and objects—monitors, night lights, pacifiers, cuddle cloths, sound machines—to accomplish the same things Asian parents do by having their infant beside them.

the first few postnatal months." As a result many parents become "desperate" and institute patterns that they may later regret. (Russell et al., 2013, p. 68). This is more common in first-time parents; sleep problems are less often reported for later-born children.

An Internet study of more than 5,000 North American children under age 3 found that, according to their parents, sleep was a problem for 25 percent (Sadeh et al., 2009). Of course, parents are more troubled by their baby's difficulty going to sleep, or staying asleep, than the baby is. This does not render sleep difficulties insignificant; overtired parents are less patient and responsive.

Parents will be frustrated if they expect their infant to conform to the parents' sleep–wake schedule because infant brain patterns and digestion do not allow young babies to sleep quietly all night long. Maternal depression and family dysfunction are more common when infants wake up frequently at night (Piteo et al., 2013).

Parent reactions shape infant sleep patterns, which in turn affect the parents (Sadeh et al., 2010). Ideally, mutual adaptations allow everyone's needs to be met, but, as the Opposing Perspectives feature explains, this is more controversial than it seems.

Especially for New Parents You are aware of cultural differences in sleeping practices, which raises a very practical issue: Should your newborn sleep in bed with you? (see response, page 143)

The argument for bed-sharing is that the parents can quickly respond to a hungry or frightened baby without needing to get up to feed or comfort their infant. Breast-feeding, often done every hour or two at first, is less exhausting when the mother can stay in bed as she nurses.

Yet the argument against bed-sharing rests on a chilling statistic: Sudden infant death is twice as likely when babies sleep beside their parents (Vennemann et al., 2012). (Sudden infant death syndrome is discussed at the end of this chapter.) Many young parents occasionally go to sleep after drinking or drugging. If their baby is beside them, bed-sharing (not merely co-sleeping) is dangerous.

Since many ethnic groups co-sleep as a cultural practice, instead of arguing against it, experts seek ways to make it safe (Ball & Volpe, 2013). One innovation is the creation of a "co-sleeper" (an attachment to the parents' bed), which avoids soft quilts or rollover danger.



YAGI STUDIO/GETTY IMAGES

One reason for opposite practices is that adults are affected by their own early experiences. This phenomenon is called *ghosts in the nursery* because new parents bring decades-old memories into the bedrooms of their children. Those ghosts can encourage either co-sleeping or separate rooms.

For example, compared with Israeli adults who, as infants, had slept near their parents, those who had slept communally with other infants (as sometimes occurred on kibbutzim) were more likely to interpret their own infants' nighttime cries as distress, requiring comfort (Tikotzky et al., 2010). That is how a ghost affects current behavior: If parents think their crying babies are frightened, lonely, and distressed, they want to respond. Quick responses are easier with co-sleeping.

But remember that infants learn from experience. If babies become accustomed to bed-sharing, they will crawl into their parents' bed long past infancy. Parents might lose sleep for years because they wanted more sleep when their babies were small.

Developmentalists hesitate to declare either co-sleeping or separate bedrooms best because the issue is "tricky and complex" (Gettler & McKenna, 2010, p. 77). Sleeping alone may encourage independence—a trait appreciated in some cultures, abhorred in others. Past experiences (ghosts in the nursery) affect us all: Should some ghosts be welcomed and others banned?

Infant at Risk? Sleeping in the parents' bed is a risk factor for SIDS in the United States, but don't worry about this Japanese girl. In Japan, 97 percent of infants sleep next to their parents, yet infant mortality is only 3 per 1,000—compared with 7 per 1,000 in the United States. Is this bed, or this mother, or this sleeping position protective?

SUMMING UP Birthweight doubles, triples, and quadruples by 4 months, 12 months, and 24 months, respectively. Height increases by about a foot (about 30 centimeters) in the first two years. Such norms are useful as general guidelines, but personal percentile rankings over time are more telling. They indicate whether a particular infant's brain and body are growing appropriately. With maturation, sleep becomes regular, dreaming becomes less common, and distinct sleep–wake patterns develop. The youngest infants sleep more hours in total but for less time at a stretch; by age 1, most babies sleep longer at night, with a nap or two during the day. Cultural and caregiving practices influence norms, schedules, and expectations.

WHAT HAVE YOU LEARNED?

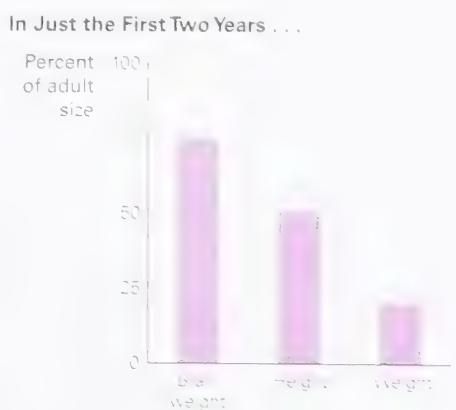
1. What specific facts indicate that infants grow rapidly in the first year?
2. Why are pediatricians not troubled when an infant is consistently small, say at the 20th percentile in height and weight?
3. How much do newborns usually sleep and dream?
4. How do sleep patterns change from birth to 18 months?

Brain Development

From two weeks after conception to two years after birth, the brain grows more rapidly than any other organ, from about 25 percent of adult weight at birth to 75 percent at age 2 (see Figure 5.4). Prenatal and postnatal brain growth, measured by head circumference, affects later cognition (Gilles & Nelson, 2012). If teething or a stuffed-up nose temporarily slows weight gain, nature slows growth of the body but not the brain, a phenomenon called **head-sparing.**

head-sparing A biological mechanism that protects the brain when malnutrition disrupts body growth. The brain is the last part of the body to be damaged by malnutrition.

FIGURE 5.4
Growing Up Two-year-olds are totally dependent on adults, but they have already reached half their adult height and three-fourths of their adult brain size.



Connections in the Brain

Head circumference provides a rough idea of how the brain is growing, which is why medical checkups include measurement of skull circumference. The distance around the head typically increases about 35 percent, from 13 to 18 inches, or from 33 to 46 centimeters, in the first year. Much more significant, although harder to measure, are changes in the brain's communication system. To understand this, we review the basics of neurological development (see Visualizing Development, p. 144).

Communication within the central nervous system (CNS)—the brain and spinal cord—begins with nerve cells, called **neurons.** Most neurons are created before birth, at a peak production rate of 250,000 new cells per minute in mid-pregnancy (Purves et al., 2004). Some of those early brain cells die before birth, as the brain prunes as well as proliferates neurons (Stiles & Jernigan, 2010).

neuron One of billions of nerve cells in the central nervous system, especially in the brain.

At birth, the human brain has billions of neurons. Some are deep inside the brain in a region called the *brain stem*, which controls automatic responses such as heartbeat, breathing, temperature, and arousal. Others are in the midbrain, in

areas that affect emotions and memory. And most neurons (about 70 percent) are in the **cortex,** the brain's six outer layers (sometimes called the *neocortex*). The cortex is crucial: Most thinking, feeling, and sensing occur in the cortex, although parts of the midbrain join in (Johnson, 2011).

The last part of the brain to mature is the **prefrontal cortex,** the area for anticipation, planning, and impulse control. It is not, as once thought, "functionally silent during most of infancy" (Grossmann, 2013, p. 303). Nonetheless, many connections between emotions and logic have not yet formed. The prefrontal cortex gradually becomes more efficient over the next decades (Wahlstrom et al., 2010). (**Developmental Link:** A major discussion of the growth of the prefrontal cortex is in Chapter 14.)

cortex The outer layers of the brain in humans and other mammals. Most thinking, feeling, and sensing involves the cortex.

prefrontal cortex The area of the cortex at the very front of the brain that specializes in anticipation, planning, and impulse control.

Specialization

All areas of the brain specialize, becoming fully functioning at different ages. Brain stem regions maintain breathing and heartbeat, and thus can sustain life by seven months after conception, or even earlier with advanced medical care. Until the brain stem begins to function, the fetus is not viable outside the womb.

Some particular areas in the midbrain underlie emotions and impulses. These functions are apparent in the first year and are shared with many other animals. For humans, emotional regulation and impulse control continue to develop throughout childhood, as those parts of the brain mature.

Specialized regions in the cortex allow particular kinds of perception and cognition, first cognition of exciting, social interactions and later cognition of more abstract thoughts (Grossmann, 2013). These areas reach final maturation in adulthood, by about age 25.

Many examples of specialization are in the cortex. There is a visual cortex, an auditory cortex, and an area dedicated to the sense of touch for each body part—including each finger of a person and each whisker of a rat (Barnett et al., 2006). These sensory areas require maturation and learning, but all are present at birth.

Humans have a much larger frontal cortex relative to body size than any other animal, and humans have many areas that are activated and coordinated with various experiences. That is why people can plan and create better than any mouse, whale, or chimpanzee.

// Response for New Parents (from page 141): From the psychological and cultural perspectives, babies can sleep anywhere as long as the parents can hear them if they cry. The main consideration is safety: Infants should not sleep on a mattress that is too soft, nor beside an adult who is drunk or drugged. Otherwise, each family should decide for itself.

Dendrites Sprouting

Within and between areas of the central nervous system, neurons are connected to other neurons by intricate networks of nerve fibers called **axons** and **dendrites** (see Figure 5.5). Each neuron has a single axon and numerous dendrites, which spread out like the branches of a tree. The axon of one neuron meets the dendrites of other neurons at intersections called **synapses,** which are critical communication links within the brain.

To be more specific, neurons communicate by sending electrochemical impulses through their axons to synapses, to be picked up by the dendrites of other neurons. The dendrites bring the message to the cell bodies of their neurons, which, in turn, convey the message via their axons to the dendrites of other neurons.

Axons and dendrites do not touch at synapses. Instead, the electrical impulses in axons typically cause the release of chemicals called **neurotransmitters,** which carry information from the axon of the sending neuron, across a pathway called the **synaptic gap,** to the dendrites of the receiving neuron, a process speeded up by myelination (**Developmental Link:** Myelination is discussed in detail in Chapter 8.)

axon A fiber that extends from a neuron and transmits electrochemical impulses from that neuron to the dendrites of other neurons.

dendrite A fiber that extends from a neuron and receives electrochemical impulses transmitted from other neurons via their axons.

synapse The intersection between the axon of one neuron and the dendrites of other neurons.

neurotransmitter A brain chemical that carries information from the axon of a sending neuron to the dendrites of a receiving neuron.

synaptic gap The pathway across which neurotransmitters carry information from the axon of the sending neuron to the dendrites of the receiving neuron.

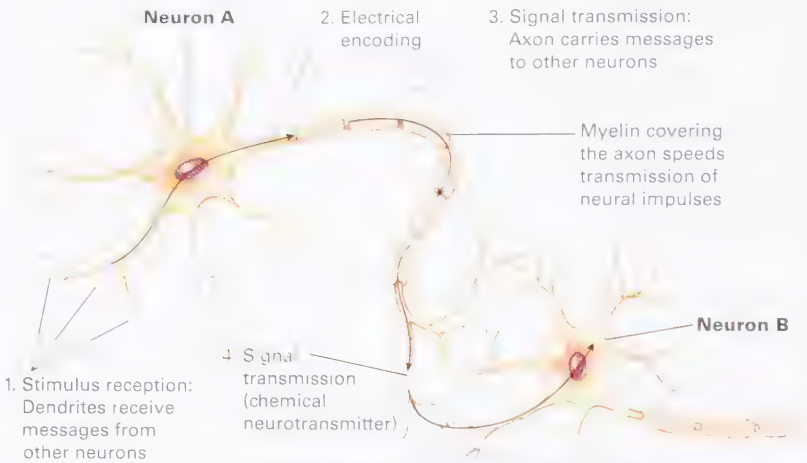
VISUALIZING DEVELOPMENT

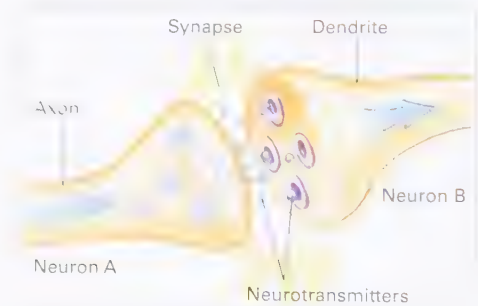
Nature, Nurture, and the Brain

The mechanics of neurological functioning are varied and complex; neuroscientists hypothesize, experiment, and discover more each day. Brain development begins with genes and other biological elements, but hundreds of epigenetic factors affect brain development from the first to the final minutes of life. Particularly important in human development are experiences: Plasticity means that dendrites form or atrophy is response to nutrients and events. The effects of early nurturing experiences are lifelong, as proven many times in mice; research on humans suggests similar effects.

NATURE

Human brains are three times as large per body weight and take years longer to mature than the brains of any other creature, but the basics of brains are the same from mouse to elephant. New dendrites form and unused ones die—especially in infancy and adolescence. Brain plasticity is lifelong.





In the synapse—an intersection between axon and dendrite—neurotransmitters carry information from one neuron to another.



NURTURE

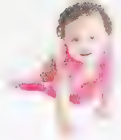
In the developing brain, connections from axon to dendrite reflect how a baby is treated. In studies of rats, scientists learned that when a mother mouse licks her newborn its methylation of a gene (called Nr3c1) is reduced, allowing increased serotonin to be released by the hypothalamus and reducing stress hormones. Baby mice who were frequently licked and nuzzled by their mothers developed bigger and better brains!

Researchers believe that, just as in rats, the human mothers who cuddle, cradle, and caress their babies shape their brains for decades.



[illegible]	[illegible]
• High stress hormone levels • High anxiety	• Low stress hormone levels • Low anxiety





Exuberance and Pruning

At birth, the brain contains at least 100 billion neurons, more than a person needs. Some of these neurons disappear in programmed cell death, and some new neurons will be created, but not as many as were created before birth. By contrast, the newborn's brain has far fewer dendrites and synapses than the person will eventually need. During the first months and years, rapid growth and refinement in axons, dendrites, and synapses occur, especially in the cortex. Dendrite growth is the major reason that brain weight triples from birth to age 2 (Johnson, 2011).

An estimated fivefold increase in dendrites in the cortex occurs in the 24 months after birth, with about 100 trillion synapses being present at age 2. According to one expert, "40,000 new synapses are formed every second in the infant's brain" (Schore & McIntosh, 2011, p. 502).



FIGURE 5.5

How Two Neurons Communicate The infant brain contains billions of neurons, each with one axon and many dendrites. Every electrochemical message causes thousands of neurons to fire, each transmitting the message across the synapse to neighboring neurons. This electron micrograph shows neurons greatly magnified, with their tangled but highly organized and well-coordinated sets of dendrites and axons.

This extensive *postnatal* brain growth is highly unusual for mammals. It occurs in humans because heads cannot grow large enough before birth to contain the brain networks needed to sustain human development. Although prenatal brain development is remarkable, it is limited because the human pelvis is relatively small, so the newborn head must be much smaller than the adult head to make birth possible. For that reason, unlike other mammals, humans must nurture and protect their offspring for more than a decade while the child's brain continues to develop (Konner, 2010).

Early dendrite growth is called **transient exuberance:** *exuberant* because it is so rapid and *transient* because some of it is temporary. The expansive brain growth is followed by **pruning.** Just as a gardener might prune a rose bush by cutting away some growth to enable more, or more beautiful, roses to bloom, unused brain connections atrophy and die.

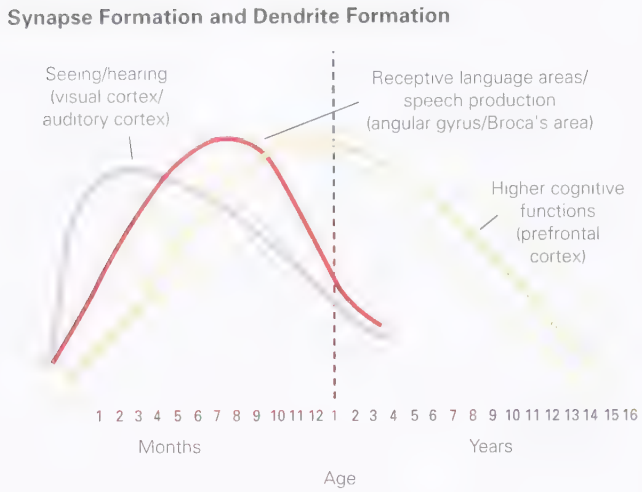
transient exuberance The great but temporary increase in the number of dendrites that develop in an infant's brain during the first two years of life.

pruning When applied to brain development, the process by which unused connections in the brain atrophy and die.

As one expert explains it, there is an "exuberant overproduction of cells and connections followed by a several year long sculpting of pathways by massive elimination" (Insel, 2014, p. 1727). Notice the word *sculpting*, as if a gifted artist created an intricate sculpture from raw marble or wood. Human infants are gifted and flexible artists, developing their brains as needed for whatever family, culture, or society they happen to be born into.

Thinking and learning require connections among many parts of the brain, a process made more efficient because some potential connections are pruned. For example, to understand any sentence in this text, you need to know the letters, the words, the surrounding text, the ideas they convey, and how they relate to your other thoughts and experiences. You also realize that your understanding differs from that of another, especially if that other person grew up in a home and nation unlike yours. That realization begins long past infancy.

Babies' brains have the same requirements, with pruning first in the sensory cortex (especially if a baby does not hear or see anything) and then in other parts of the brain. No wonder it takes years to learn to read (see the Thinking Critically feature in Chapter 6), and no wonder your brain automatically reads these roman letters, and, for most of you, is befuddled when viewing Arabic, Cyrillic, or Chinese words.



Source: Adapted from R. A. Thompson & Nelson, 2001, p. 8

FIGURE 5.6

Brain Growth in Response to Experience
These curves show the rapid rate of experience-dependent synapse formation for three functions of the brain (senses, language, and analysis). After the initial increase, the underused neurons are gradually pruned, or inactivated, as no functioning dendrites are formed from them.

Experience Shapes the Brain

The specifics of brain structure and growth depend not only on genes and maturation: Experience may be even more crucial. Infant brain organization itself depends partly on input, and some dendrites wither away because they are never used—that is, no experiences have caused them to send a message to other neurons.

Expansion and pruning of dendrites occur for every aspect of early experience, from noticing musical rhythms to understanding emotions (Scott et al., 2007). Experience—both expected and varied—shapes the infant brain, as pruning eliminates unused connections.

Strangely enough, this loss of dendrites increases brainpower. The space between neurons in the human brain—especially in regions for advanced, abstract thought—is far greater than the space in chimpanzee brains (Miller, 2010). It may seem logical that the more densely packed neurons of chimps would make them smarter than people, but the opposite is true. The probable explanation is that having more space for dendrite formation allows more connections as well as more pruning, thus fostering complex thinking.

Further evidence of the benefit of cell death comes from one of the sad symptoms of fragile X syndrome (described in Chapter 3), "a persistent failure of normal synapse pruning" (Irwin et al., 2002, p. 194). Affected children experience intellectual slowness without this pruning; their dendrites are too dense and long, making thinking difficult. Similar problems occur for children with autism: their brains are unusually large and full, which makes communication between neurons less efficient (Lewis et al., 2013).

Thus, pruning is essential. Normally, as brains mature, the process of extending and eliminating dendrites is exquisitely attuned to experience, as the appropriate links in the brain are established, protected, and strengthened. As with the rose bush, pruning needs to be done carefully, allowing further growth.

Without certain experiences, some pruning may occur that limits later thought rather than aiding it. One group of scientists speculates that "lack of normative experiences may lead to overpruning of neurons and synapses, both of which may lead to reduction of brain activity" (Moulson et al., 2009, p. 1051).

Necessary and Possible Experiences

What are those needed "normative experiences"? A scientist named William Greenough identified two experience-related aspects of brain development (Greenough et al., 1987):

- **Experience-expectant brain function.** Certain functions require basic experiences in order to develop, just as a tree requires water. Those experiences are part of almost every infant's life, and thus, almost every human brain grows as human genes direct. Brains need and expect such experiences; development would suffer without them.
- **Experience-dependent brain function.** Some brain functions depend on particular experiences. These specific experiences are not essential: They happen to infants in some families and cultures but not in others. Because of experience-dependent experiences, humans can be quite different from one another, yet all fully human.

experience-expectant brain functions
Brain functions that require certain basic common experiences (which an infant can be expected to have) in order to develop normally.

experience-dependent brain functions
Brain functions that depend on particular, variable experiences and that therefore may or may not develop in a particular infant.



The basic, expected experiences *must* happen for normal brain maturation to occur, and they almost always do. For example, in deserts and in the Arctic, on isolated farms and in crowded cities, almost all babies have things to see, objects to manipulate, and people to love them. Babies everywhere welcome such experiences: They look around, they grab for objects, they smile at people. As a result, baby brains develop. Without such expected experiences, brains might wither.

In contrast, dependent experiences *might* happen; because of them, one brain differs from another, even though both brains are developing normally. Experiences vary, such as which language babies hear, what faces they see, whether curiosity is encouraged, or how their mother reacts to frustration.

Depending on those particulars, infant brains vary in structure and connections; some dendrites grow and some neurons thrive while others die (Stiles & Jernigan, 2010). Consequently, experience-expectant events make all people similar, yet everyone is unique because each undergoes particular experience-dependent experiences.

An important application of experience-expectant and experience-dependent brain development comes from research on twins (Tucker-Drob et al., 2011). Generally, children who grow up in low-income families tend to have lower intelligence scores than those in higher income families, especially when the family is stressed by having two babies to raise at the same time. Is this difference an experience-expectant or experience-dependent result? It depends.

Until about 10 months, no matter what their SES, families with twins provide adequate experience-expectant circumstances (things to see, people to love). However, once the babies begin walking and talking, those from high-SES families are more likely to be encouraged to explore, talk, and play. Consequently, almost all high-SES toddlers have adequate experience-dependent conditions for intellectual growth. When differences appear in their IQ, they can usually be traced to genetic differences, not experiential ones.

Some low-SES families encourage experience-dependent cognition and some do not, and the results are likely to become evident when the families have toddler twins. Whatever intelligence differences appear between twins in low-SES families are likely attributable to differences in experience-dependent stimulation, but for twins in high-SES families, experience-dependent stimulation is likely to be sufficient (Tucker-Drob et al., 2011).

Especially for Parents of Grown Children
Suppose you realize that you seldom talked to your children until they talked to you and that you often put them in cribs and playpens. Did you limit their brain growth and their sensory capacity? (see response, page 149)

Examples from Bird Brains

The distinction between essential and variable input to the brain's networks can be made for all mammals. But some of the most persuasive research has been done with songbirds. All male songbirds have a brain region dedicated to listening and reproducing sounds (experience-expectant), but birds of the same species that happen to live in different locations produce slightly different songs (experience-dependent) (Konner, 2010).

These birdsongs are not unlike regional accents, as with English-speaking adults who grew up in Kingston (Jamaica) or Kolkata (India) or Kalamazoo (United States). Indeed, accents vary even by neighborhood in any large city.

Birds inherit genes that produce the brain cells they need, which might be neurons dedicated to learning new songs (canaries) or to finding hidden seeds (chickadees). That is experience-expectant: Songs and seeds are essential. For the dendrites and neurons to connect as needed within the particular ecological niche, birds *depend* on specific experiences with learning songs or finding seeds (Barinaga, 2003).

A human example comes from face recognition: All infants need to see faces (experience-expectant), but which particular face differences they learn to notice depends on who they see, as the following explains.

a view from science

Face Recognition

Unless you have *prosopagnosia* (face blindness, relatively uncommon), the *fusiform face area* of your brain is astonishingly adept at face recognition. This area is primed among newborns, who are quicker to recognize a face they have just seen once than older children and adults (Zeifman, 2013). However, because of experience-expectancies, every face is fascinating early in life: Babies stare at pictures of monkey faces and photos of human ones, at drawings and toys with faces, as well as at live faces.

Soon, experiences refine perception, and experience-dependent learning begins (de Heering et al., 2010). By 3 months, babies smile more readily at familiar people and are more accurate at differentiating faces from their own ethnic group (called the *own-race effect*). Babies are not prejudiced: The own-race effect results from limited multiethnic experience.

Indeed, children of one ethnicity, adopted and raised exclusively among people of another ethnicity, recognize differences among people of their adopted group more readily than differences among people of their biological group (Telzer et al., 2013).

The importance of early experience is confirmed by two studies. In the first study, from 6 to 9 months of age infants were repeatedly shown a book with pictures of six monkey faces, each with a name written on the page (see photo). One-third of the infants' parents read the names while showing the pictures; another one-third said only "monkey" as they turned each page; the final one-third simply turned the pages with no labeling.

At 9 months, infants in all three groups viewed pictures of six *unfamiliar* monkeys. The infants who had heard names of monkeys were better at distinguishing one new monkey from another than were the infants who saw the same picture book but did not hear each monkey's name (Scott & Monesson, 2010).

Now consider the second study. It is known that most people do not notice the individuality of newborns. Some even claim that "all babies look alike." However, one study found that 3-year-olds with younger siblings were much better at recognizing differences between photos of unfamiliar newborns than were 3-year-olds with no younger brothers or sisters (Cassia et al., 2009). This finding shows, again, that experience matters, contributing to development of dendrites in the fusiform face area.

The ability to differentiate faces improves with age—you are now quicker to recognize your best friend than you were as a child. Distinguishing individual faces is best learned via early exposure, but adults can learn to recognize individuals of other ethnic groups or even individual animals of the same species or breed. This recognition takes slightly longer without early experience involving dozens of named individuals from that group, but it is never too late to learn. Infancy is a sensitive period, but plasticity is lifelong.

ADAPTED FROM SCOTT, LISA S. & MONESSON, ALEXANDRA. "PERCEPTUAL DEVELOPMENT IN INFANCY DURING SPECIALIZATION." 2010. 37-2008. COPYRIGHT 2010 WITH PERMISSION FROM ELSEVIER



Iona Is Not Flora If you heard that Dario was not Louis or Boris, would you stare at unfamiliar monkey faces more closely in the future? For 6-month-olds, the answer is yes.

Harming the Infant Brain

Thus far, we have focused on the many normal variations that families offer babies; most infants develop well within their culture. For brain development, it does not matter whether a person learns French or Farsi or expresses emotions dramatically or subtly (e.g., throwing themselves to the floor or merely pursing their lips, a cultural difference). However, the research has also found that infant brains do not develop well if they do not have the basic experiences that all humans expect and need.



Lack of Stimulation

To begin with, infants need stimulation. Playing with a young baby, allowing varied sensations, and encouraging movement (arm waving in the early months, walking later on) are all fodder for brain connections. Severe lack of stimulation stunts the brain, as has been shown many times, not only with mice but also with humans. As one review explains, "enrichment and deprivation studies provide powerful evidence of . . . widespread effects of experience on the complexity and function of the developing system" (Stiles & Jernigan, 2010, p. 345).

This does not mean that babies require spinning, buzzing, multitextured, and multicolored toys. In fact, such toys may be a waste of money. Infants are fascinated by simple objects and facial expressions. Fortunately, although elaborate infant toys are not needed, there is no evidence that they harm the brain; babies prevent overstimulation by ignoring them. A simple application of what has been learned about the prefrontal cortex is that hundreds of objects, from the very simple to the quite complex, can capture an infant's attention.

Stress and the Brain

In addition to lack of stimulation, some specific experiences are particularly harmful, especially in the first six months (Jansen et al., 2010). If the brain produces an overabundance of stress hormones (as when an infant is frequently terrified, or when the whole family experiences a massive earthquake and flood), sometimes that damages the brain's later functioning.

If the brain later produces too few stress hormones, that might make the person emotionally flat (never happy, sad, or angry). Note that this is an emotional response. An infant might be terrified (by yelling, frightening faces, witnessed abuse) without directly being hurt.

Exactly how and when this happens is not yet clear; research finds conflicting conclusions (Jansen et al., 2010). Some stress seems part of every infant's life: It may even be experience-expectant, necessary for later emotional development. But there is a limit to how much stress an infant can accommodate, and too much early stress is likely to be maladaptive later on (Propper & Holochwost, 2013).

For example, years later, a kindergarten teacher might notice that one child becomes furious or terrified at a slight provocation and another child seems indifferent to everything. Why? In both cases, the underlying cause could be excessive stress-hormone production in infancy, changing how that child's brain responds to stress.

Shaken Baby Syndrome

Another example is much more direct, the consequence of adults who do not understand the immaturity of the infant brain. Because the prefrontal cortex has not yet developed, telling infants to stop crying is pointless because they cannot *decide* to stop crying. Such decisions require brain maturity not yet present.

Some adults react to crying by shaking a baby. This can cause **shaken baby syndrome,** a life-threatening condition that occurs when infants are shaken back and forth sharply and quickly. That stops the crying because blood vessels in the brain rupture and neural connections break. Pediatricians consider shaken baby syndrome an example of *abusive head trauma* (Christian et al., 2009). Death is the worst consequence; lifelong intellectual impairment is the more likely one.

Not every infant who has neurological symptoms of head trauma is the victim of abuse. In fact, legal experts worry that some caregivers are falsely accused of shaking a baby when other organic causes of brain damage occur (Byard, 2014).

Response for Parents of Grown Children (from page 147): Probably not. Brain development is programmed to occur for all infants, requiring only the stimulation that virtually all families provide—warmth, reassuring touch, overheard conversation, facial expressions, movement. Extras such as baby talk, music, exercise, mobiles, and massage may be beneficial but are not essential.

shaken baby syndrome A life-threatening injury that occurs when an infant is forcefully shaken back and forth, a motion that ruptures blood vessels in the brain and breaks neural connections.

Nonetheless, infant brains are more vulnerable and infant behavior less controllable than adults', so the response to a screaming, frustrating baby should be to comfort or walk away, never to shake, yell, or hit.

Lest you cannot imagine the frustration that some parents feel when their baby cries, consider what one mother in Sweden said about her colicky baby, now age 4.

> There were moments when, both me and my husband... when she was apoplectic and howling so much that I almost got this thought, 'now I'll take a pillow and put over her face just until she quietens down, until the screaming stops' (Landgren et al., 2012

Severe Social Deprivation

The developmental community was stunned and saddened by the discovery of a girl named Genie, born in 1957. Genie spent most of her childhood tied to a chair, never hearing human speech (her father barked and growled at her) or feeling love, because her parents were severely disturbed. After being discovered at age 13, she eventually responded to affection and learned to talk, but she never spoke or responded as a normal child would. Most developmentalists concluded that her rescue came too late; her brain had already passed the sensitive period for development of many abilities.



AP Photo

A Fortunate Pair Elaine Himelfarb (shown in the background), of San Diego, California, is shown here in Bucharest about to adopt 22-month-old Maria. This joyous moment may be represented through Maria's childhood—or maybe not.

But Genie was just one person, and as you remember from Chapter 1, one case is not proof of any general principle. Perhaps Genie had been born with brain damage. Or perhaps her early care after the rescue was itself traumatic (Rymer, 1994).

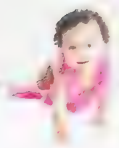
More research, with more participants, was needed but would be unethical to perform with humans. Consequently, Marian Diamond, William Greenough, and their colleagues studied some "deprived" rats (raised alone in small, barren cages) and compared them with "enriched" rats (raised in large cages with toys and other rats). In this experiment, both deprived and enriched rats were killed and their brains studied. The brains of the enriched rats were larger and heavier, with more dendrites (M. C. Diamond, 1988; Greenough & Volkmar, 1973).

Much research with other mammals confirms that isolation and sensory deprivation harm the developing brain. Social and emotional development are especially affected by deprivation. This is further explored with longitudinal studies of orphans from Romania, as described in Chapter 7.

Intervention

The fact that infant brains respond to their circumstances suggests that waiting until proof that a young child is mistreated is waiting too long. At birth, babies begin to adapt to their world, becoming withdrawn and quiet if their caregivers are depressed or becoming loud and demanding if that is the best way to get fed.

Such early reactions help babies survive but set patterns that are destructive later on. Thus, understanding development as dynamic and interactive means helping caregivers from the start, not waiting until destructive patterns are established (Tronick & Beegly, 2011).



A program to do this, beginning with high-risk mothers *before* any evidence of problems arose and including individualized support that did not require the mothers to leave their homes, resulted in less stress for the mothers and improved language development in the infants (Lowell et al., 2011). Developmentalists want this for every infant, either formally as in this program, or informally as when a relative or a neighbor helps a new mother with whatever she needs.

Implications for Caregivers

Developmental discoveries about early brain development have many implications for loving, low-risk caregivers as well as those at high risk. First, since each brain region follows a sequence of growing, connecting, and pruning, it helps to know which developmental events are experience-expectant and when those expectations arise.

For example, proliferation and pruning begin at about 4 months in the visual and auditory cortexes, which explains why very young infants are attentive to sights and sounds. Consequently, remedies for blind or deaf infants should occur early in life to prevent atrophy of those brain regions. Hearing-impaired infants whose difficulties are recognized and remediated with cochlear implants before age 2 become more adept at understanding and expressing language than those with the same losses who get implants after 2½ (Tobey et al., 2013). Brain expectancy is the reason.

The language areas of the brain develop most rapidly between the ages of 6 and 24 months; that is when infants most need to hear speech, so they can recognize the characteristics of their local language long before they utter a word (Saffran et al., 2006). At the same time, some experiences are probably meaningless before the brain is ready. A 6-month-old might be indifferent to books, yet book-reading may be a favorite activity at 12 months. Infants respond to whatever their brains need; that's why musical mobiles, cars on the street, and, best of all, animated caregivers, are fascinating.

This preference reflects **self-righting,** the inborn drive to remedy deficits. Infants with few toys develop their brains by using whatever is available. Their brains expect human interaction and whatever objects their parents find to interest them. Neurons are designed to develop dendrites; plasticity is apparent from the beginning of life (Tomalski & Johnson, 2010).

self-righting The inborn drive to remedy a developmental deficit; literally, to return to sitting or standing upright after being tipped over. People of all ages have self-righting impulses, seeking emotional as well as physical balance.

Thus, how people respond to infants echoes lifelong. This means that caressing a newborn, singing to a preverbal infant, and showing affection toward a toddler may be essential to developing the child's full potential. If such experiences are missing, lifelong brain damage may result.

SUMMING UP Brain growth is rapid during the first months of life, when the number of dendrites and synapses within the cortex increases exponentially. By age 2, the brain already weighs three-fourths of its adult weight. Pruning of underused and unconnected dendrites begins in the sensory areas and then occurs in other areas. Although some brain development is maturational, experience is also essential—both the universal experiences that almost every infant has (experience-expectant brain development) and the particular experiences that reflect the child's family or culture (experience-dependent brain development). Infant brains need stimulation—though not so much as to become overwhelming—for dendrites to grow and neurological connections to proliferate. Extreme early stress or social deprivation may permanently harm the person's brain.

WHAT HAVE YOU LEARNED?

1. What is the difference between the cortex and the rest of the brain?
2. How does the brain change from birth to age 2?
3. How can pruning increase brain potential?
4. What is the difference between experience-expectant and experience-dependent brain function?
5. What is the effect of stress or social deprivation on early brain development?
6. What should caregivers remember about brain development when an infant cries?

Perceiving and Moving

You learned in Chapter 2 that Piaget called the first period of intelligence the *sensorimotor* stage, emphasizing that cognition develops from the senses and motor skills. The same concept—that infant brain development depends on sensory experiences and early activity—underlies the discussion you have just read. Experience molds the brain, which seeks an array of sensory and motor experiences.

The Senses

Every sense functions at birth. Newborns have open eyes, sensitive ears, and responsive noses, tongues, and skin. Indeed, very young babies use all their senses to attend to everything. For instance, in the first months of life, they smile at strangers and suck almost anything in their mouths.

Why are new infants not more discriminating? Because sensation precedes perception. Then perception leads to cognition. Thus, in order to learn, babies begin by responding to every sensation that might be significant; they will learn which sensations are meaningful.

sensation The response of a sensory system (eyes, ears, skin, tongue, nose) when it detects a stimulus.

Sensation occurs when a sensory system detects a stimulus, as when the inner ear reverberates with sound or the eye's retina and pupil intercept light. Thus, sensations begin when an outer organ (eye, ear, nose, tongue, or skin) meets anything that can be seen, heard, smelled, tasted, or touched.

Genetic selection over more than 100,000 years affects all the senses. Humans cannot hear what mice hear, or see what bats see, or smell what puppies smell; humans do not need those sensory abilities. However, survival requires babies to respond to people, and newborns innately do so with every sense they have (Konner, 2010; Zeifman, 2013).

perception The mental processing of sensory information when the brain interprets a sensation.

Perception occurs when the brain processes a sensation. This happens in the cortex, usually as the result of a message from one of the sensing organs, such as from the eye to the visual cortex. If a particular sensation occurs often, it connects with past experience, making a particular sight worth interpreting (M. E. Diamond, 2007).

Some sensations are beyond a baby's comprehension at first. A newborn has no idea that the letters on a page might have significance, that Sister's face should be distinguished from Brother's, or that the smells of roses and garlic have different connotations. Perceptions require experience.

Infants' brains are especially attuned to their own repeated social experiences. Thus, a newborn named Emily has no concept that *Emily* is her name, but she has the brain and auditory capacity to hear sounds in the usual speech range (not the high sounds that only dogs can hear) and an inborn preference for repeated patterns and human speech, so she attends to people saying her name. At about 4 months, when her auditory cortex is rapidly creating and pruning dendrites, the

repeated word *Emily* is perceived as well as sensed, especially because that sound emanates from the people Emily has learned to love. Before 6 months, Emily may open her eyes and turn her head when her name is called. It will take many more months before she tries to say "Emmy" and still longer before she knows that *Emily* is indeed her name.

Thus, perception follows sensation, when sensory stimuli are interpreted in the brain. Then cognition follows perception, when people think about what they have perceived. (Later, cognition no longer depends on sensation: People imagine, fantasize, hypothesize.) The sequence from sensation to perception to cognition requires that an infant's sense organs function. No wonder the parts of the cortex dedicated to hearing, seeing, and so on develop rapidly. Now some specifics.

Hearing

The sense of hearing develops during the last trimester of pregnancy and is already quite acute at birth, when certain sounds trigger reflexes, even without conscious perception. Sudden noises startle newborns, making them cry. Familiar, rhythmic sounds such as a heartbeat are soothing: That is one reason kangaroo care reduces newborn stress, because the infant's ear rests on the mother's chest. (**Developmental Link:** Kangaroo care is explained in Chapter 4.)

A newborn's hearing can be checked with advanced equipment; this is routinely done at most hospitals in North America and Europe, since early remediation benefits deaf infants. Screening is needed later as well because some infants develop hearing losses in the early months (Harlor & Bower, 2009). Normally, even in the first days of life, infants turn their heads at a sound. Soon they can pinpoint the source of the noise.

Because of maturation of the language areas of the cortex, even 4-month-old infants attend to voices, developing expectations of the rhythm, segmentation, and cadence of spoken words long before comprehension (Minagawa-Kawai et al., 2011). Soon, sensitive hearing combines with the maturing brain to distinguish patterns of sounds and syllables.

Infants become accustomed to their native language, such as which syllable is stressed (dialects vary), if changing inflection matters (as in Chinese), whether certain sound combinations are repeated, and so on. All this is based on very careful listening to human speech, including speech not directed toward them with words they do not yet understand (Buttelmann et al., 2013).

Seeing

By contrast, vision is immature at birth. Although in mid-pregnancy the eyes open and are sensitive to bright light (if the pregnant woman is sunbathing in a bikini, for instance), the fetus has nothing much to see. Consequently, newborns are legally blind; they focus only on things between 4 and 30 inches (10 and 75 centimeters) away (Bornstein et al., 2005).

Almost immediately, experience combines with maturation of the visual cortex to improve the ability to see shapes and notice details. Vision improves so rapidly that researchers are hard-pressed to describe the day-by-day improvements (Dobson et al., 2009).

By 2 months, infants not only stare at faces, but also, with perception, smile. (Smiling can occur earlier but not because of perception.) As perception builds, visual scanning improves. Thus, 3-month-olds look closely at the eyes and mouth, smiling more at smiling faces than at angry or expressionless ones. They pay attention to patterns, colors, and motion (Kellman & Arterberry, 2006).

Especially for Nurses and Pediatricians
The parents of a 6-month-old have just been told that their child is deaf. They don't believe it because, as they tell you, the baby babbles as much as their other children did. What do you tell them? (see response, page 155)

Who's This? Newborns don't know much, but they look intently at faces. Repeated sensations become perceptions, so in about 6 weeks, this baby will smile at Dad, Mom, a stranger, the dog, and at every other face. If this father in Utah responds like typical fathers everywhere, by 6 months cognition will be apparent: The baby will chortle with joy at seeing him but become wary of unfamiliar faces.



BLEND IMAGES / GETTY IMAGES

binocular vision The ability to focus the two eyes in a coordinated manner in order to see one image.

Because **binocular vision** (coordinating both eyes to see one image) is impossible in the womb (nothing is far enough away), many newborns seem to use their two eyes independently, momentarily appearing wall-eyed or cross-eyed. Normally, experience leads to rapid focus and binocular vision. Usually between 2 and 4 months, both eyes focus on a single thing (Wang & Candy, 2010).

This ability aids in the development of depth perception, which has been demonstrated in 3-month-olds, although it was once thought to develop much later. Toddlers who are experienced crawlers and walkers are very adept at deciding if a given path is safe to cross upright or is best traversed sitting or crawling. This illustrates early coordination of the senses and motor skills (Kretch & Adolph, 2013). (This does not mean that toddlers can be trusted not to fall off tables or out of windows.)

Tasting and Smelling

As with vision and hearing, smell and taste function at birth and rapidly adapt to the social world. Infants learn to appreciate what their mothers eat, first through breast milk and then through smells and spoonfuls of the family dinner.

Some herbs and plants contain natural substances that are medicinal. The foods of a particular culture may aid survival: For example, bitter foods provide some defense against malaria, hot spices help preserve food and thus work against food poisoning, and so on (Krebs, 2009). Thus, for 1-year-olds, developing a taste for their family cuisine may save their lives.

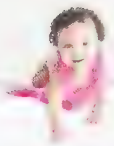


Learning About a Lime As with every other normal infant, Jacqueline's curiosity leads to taste and then to a slow reaction, from puzzlement to tongue-out disgust. Jacqueline's responses demonstrate that the sense of taste is acute in infancy and that quick brain perceptions are still to come.

Families who eat foods that protected their community pass on those preferences to their children throughout childhood. Taste preferences endure when a person migrates to another culture or when historical circumstances change so that a particular food that was once protective is no longer so. Indeed, one reason for the obesity epidemic is that, when starvation was a threat, families sought high-fat foods; now their descendants enjoy French fries, whipped cream, and bacon, jeopardizing their health.

Adaptation also occurs for the sense of smell. When breast-feeding mothers used a chamomile balm to ease cracked nipples during the first days of their babies' lives, those babies preferred that smell almost two years later, compared with babies whose mothers used an odorless ointment (Delaunay-El Allam et al., 2010).

As babies learn to recognize each person's scent, they prefer to sleep next to their caregivers, and they nuzzle into their caregivers' chests—especially when the



adults are shirtless. One way to help infants who are frightened of water (some love bathing, some hate it) is for the parent to join the baby in the tub. The smells of the adult's body mix with the smell of soap. The smell, touch, sight, and voice of the caretaker are pleasant, making the entire experience comforting.

Touch and Pain

The sense of touch is acute in infants. Wrapping, rubbing, massaging, and cradling are each soothing to many new babies. Even when their eyes are closed, some infants stop crying and visibly relax when held securely by their caregivers. The newborn's ability to be comforted by touch is tested in the Brazelton NBAS, described in Chapter 4. In the first year of life, their heart rate slows and babies relax when stroked gently and rhythmically on the arm (Fairhurst et al., 2014).

Pain and temperature are not among the traditional five senses, but they are often connected to touch. Some babies cry when being changed, distressed at the sudden coldness on their skin. Some touches are unpleasant—a poke, pinch, or pat—although this varies from one baby to another.

Scientists are not certain about infant pain. Some experiences that are painful to adults (circumcision, setting of a broken bone) are much less so to newborns, although that does not mean that newborns never feel pain (Reavey et al., 2014). For many newborn medical procedures, from a pinprick to minor surgery, a taste of sugar right before the event is an anesthetic. An empirical study conducted with an experimental group and a control group found that newborns typically cry lustily when their heel is pricked (to get a blood sample, routine after birth) but not if they have had a drop of sucrose beforehand (Harrison et al., 2010).

Some people imagine that the fetus feels pain; others say that the sense of pain does not mature until months after birth. Many young infants cry inconsolably, at times; digestive pain is the usual explanation. Often, infants fuss before their first tooth erupts: Teething is said to be painful. However, these explanations are unproven; infant crying may not indicate pain, and absence of crying does not necessarily mean absence of pain (true for adults, too).

Physiological measures, including stress hormones, erratic heartbeats, and rapid brain waves, are studied to assess pain in preterm infants, who typically undergo many procedures that would be painful to an adult (Holsti et al., 2011). Infants' brains are immature: We cannot assume that they do, or do not, feel pain, or feel it in the way that we do.

// **Response for Nurses and Pediatricians** (from page 153): Urge the parents to begin learning sign language and investigate the possibility of cochlear implants. Babbling has a biological basis and begins at a specified time, in deaf as well as hearing babies. If their infant can hear, sign language does no harm. If the child is deaf, however, noncommunication may be destructive.



The First Blood Test This baby will cry, but most experts believe the heel prick shown here is well worth it. The drops of blood will reveal the presence of any of several genetic diseases, including sickle cell disease, cystic fibrosis, and phenylketonuria. Early diagnosis allows early treatment, and the cries subside quickly with a drop of sugar water or a suck of breast milk.

Motor Skills

motor skills The learned abilities to move some part of the body, in actions ranging from a large leap to a flicker of the eyelid. (The word *motor* here refers to movement of muscles.)

The most dramatic **motor skill** (any movement ability) is independent walking, which explains why I worried when Bethany did not take a step (as described in the introduction to this chapter). All the basic motor skills, from the newborn's head-lifting to the toddler's stair-climbing, develop over the first two years.

The first evidence of motor skills is in the reflexes, explained in Chapter 4. Although the definition of reflexes implies that they are automatic, their strength and duration vary from one baby to another. Many newborn reflexes disappear by 3 months, but some morph into more advanced motor skills.

Caregiving and culture matter. Reflexes become skills if they are practiced and encouraged. As you saw in the chapter's beginning, Mrs. Todd set the foundation for my fourth child's walking when Sarah was only a few months old. Similarly, some very young babies can swim—if adults have helped them in the water.

Gross Motor Skills

gross motor skills Physical abilities involving large body movements, such as walking and jumping. (The word *gross* here means "big.")

Deliberate actions that coordinate many parts of the body, producing large movements, are called **gross motor skills.** These skills emerge directly from reflexes and proceed in a *cephalocaudal* (head-down) and *proximodistal* (center-out) direction. Infants first control their heads, lifting them up to look around. Then they control their upper bodies, their arms, and finally their legs and feet. (See At About This Time.)

Sitting develops gradually; it requires developing the muscles to steady the top half of the body. By 3 months, most babies can sit propped up in a lap. By 6 months, they can usually sit unsupported. Babies never propped up (as in some institutions for abandoned babies) sit much later.

Crawling is another example of the head-down and center-out direction of skill mastery. When placed on their stomachs, many newborns reflexively try to lift

OBSERVATION QUIZ Which of these skills has the greatest variation in age of acquisition? Why? (see answer, page 158)



at about this time

Age Norms (in Months) for Gross Motor Skills

	When 50% of All Babies Master the Skill	When 90% of All Babies Master the Skill
Sit unsupported	6	7.5
Stands holding on	7.4	9.4
Crawls (creeps)	8	10
Stands not holding	10.8	13.4
Walking well	12.0	14.4
Walk backward	15	17
Run	18	20
Jump up	26	29

Note: As the text explains, age norms are affected by culture and cohort. The first five norms are based on babies in five continents (Brazil, Ghana, Norway, USA, Oman, and India) (World Health Organization, 2006). The next three are from a USA-only source (Coovadia & Wittenberg, 2004, based on Denver II (Frankenburg et al., 1992)). Mastering skills a few weeks earlier or later does not indicate health or intelligence. Being very late, however, is a cause for concern

their heads and move their arms as if they were swimming. As they gain muscle strength, infants wiggle, attempting to move forward by pushing their arms, shoulders, and upper bodies against whatever surface they are lying on.

Usually by 5 months, infants add their legs to this effort, inching forward (or backward) on their bellies. Exactly when this occurs depends partly on how much "tummy time" the infant has had to develop the muscles, and that, of course, is affected by the caregiver's culture (Zachry & Kitzmann, 2011).

Between 8 and 10 months after birth, most infants can lift their midsections and crawl (or *creep*, as the British call it) on "all fours," coordinating the movements of their hands and knees. Crawling depends on experience as well as maturation. Some normal babies never do it, especially if the floor is cold, hot, or rough, or if they have always lain on their backs (Pin et al., 2007). It is not true that babies *must* crawl to develop normally.



DIMBLOE/IGHI/GETTY IMAGES

Advancing and Advanced At 8 months, she is already an adept crawler, alternating hands and knees, intent on progress. Probably she will be walking before a year.

All babies find some way to move before they can walk (inching, bear-walking, scooting, creeping, or crawling), but many resist being placed on their stomachs. Overweight babies master gross motor skills later than thinner ones: Practice and balance is harder when the body is heavy (Slining et al., 2010). As soon as they are able, babies walk (falling frequently but getting up undaunted and trying again), because walking is much quicker than crawling, and it has another advantage—free hands (Adolph et al., 2012).

The dynamic system underlying every motor skill has three interacting elements: strength, maturation, and practice. We illustrate these three here with walking.

1. *Muscle strength.* Newborns with skinny legs and 3-month-olds buoyed by water make stepping movements, but 6-month-olds on dry land do not; their legs are too chubby for their underdeveloped muscles. As they gain strength, they stand and then walk.
2. *Brain maturation.* The first leg movements—kicking (alternating legs at birth and then both legs together or one leg repeatedly at about 3 months)—occur without much thought. As the brain matures, deliberate leg action becomes possible.
3. *Practice.* Unbalanced, wide-legged, short strides become a steady, smooth gait.

This last item, *practice*, is powerfully affected by caregiving before the first independent step. Some adults spend hours helping infants walk (holding their hands or the back of their shirts) or providing walkers (dangerous if not supervised).

Once toddlers are able to walk by themselves, they practice obsessively, barefoot or not, at home or in stores, on sidewalks or streets, on lawns or in mud. They fall often, but that does not stop them; "they average between 500 and 1,500 walking steps per hour so that by the end of each day, they have taken 9,000 walking steps and traveled the length of 29 football fields" (Adolph et al., 2003, p. 494).

Fine Motor Skills

Small body movements are called **fine motor skills.** The most valued fine motor skills are finger movements, enabling humans to write, draw, type, tie, and so on. Movements of the tongue, jaw, lips, and toes are fine movements, too.

fine motor skills Physical abilities involving small body movements, especially of the hands and fingers, such as drawing and picking up a coin. (The word *fine* here means "small.")

Video: Fine Motor Skills in Infancy and Toddlerhood
http://qrs.ly/1h4eozr





Success At 6 months, this baby is finally able to grab her toes. From a developmental perspective, this achievement is as significant as walking, as it requires coordination of feet and fingers. Note her expression of determination and concentration.

Actually, mouth skills precede finger skills by many months (newborns can suck; chewing precedes drawing by a year or more). Since every culture encourages finger dexterity, children practice finger movements, and adults teach how to use spoons, or chopsticks, or markers.

By contrast, mouth skills such as spitting or biting are not praised. (Only other children admire blowing bubbles with gum.) Eventually, most children try to whistle, an advanced skill that some adults have not mastered. One mouth skill, pronunciation, develops gradually without special encouragement, although some older children and bilingual adults need focused practice to say difficult sounds.

Regarding hand skills, newborns have a strong reflexive grasp but lack control. During their first 2 months, babies excitedly stare and wave their arms at objects dangling within reach. By 3 months, they can usually touch such objects, but because of limited eye–hand coordination, they cannot yet grab and hold on unless an object is placed in their hands.

By 4 months, infants sometimes grab, but their timing is off: They close their hands too early or too late. Finally by 6 months, with a concentrated, deliberate stare, most babies can reach, grab, and grasp almost any object that is of the right size. Some can even transfer an object from one hand to the other. Almost all can hold a bottle, shake a rattle, and yank a sister's braids.

Toward the end of the first year and throughout the second, finger skills improve as babies master the pincer movement (using thumb and forefinger to pick up tiny objects). They can feed themselves first with hands, then fingers, then utensils (Ho, 2010). (See At About This Time.)

As with gross motor skills, fine motor skills are shaped by culture and opportunity. For example, when given "sticky mittens" (with Velcro) that allow grabbing, infants master hand skills sooner than usual. Their perception advances as well (Libertus & Needham, 2010; Soska et al., 2010). More generally, all senses and motor skills expand the baby's cognitive awareness, with practice advancing both skill and cognition (Leonard & Hill, 2014).

In the second year, grasping becomes more selective, as experience sculpts the brain. Toddlers learn when *not* to pull at a sister's braids or an adult's earrings or glasses. (Wise adults remove accessories before holding a baby.)

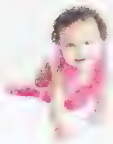
Dynamic Sensory-Motor Systems

Young human infants are, physiologically, an unusual combination of motor ineptness (they cannot walk for many months), sensory acuteness (all senses function at birth), and curiosity (Konner, 2010). What a contrast to kittens, for instance, who are born deaf, with eyes sealed shut, and who stay beside their mother although they can walk.

Human newborns listen and look from day 1, eager to practice every skill as soon as possible. An amusing example is rolling over. At about 3 months, infants can roll over from their stomachs to their backs, but not vice versa because their arms are no help when they are flat on their backs. Once they can roll from stomach to back, many babies do so and then fuss, turtle-like, with limbs flailing. When some kind bystander flips them back on their stomachs, they roll over and then fuss again. The same occurs for stairs: They can crawl up before they dare come down. Instead, they want someone to carry them down so they can crawl up again.

The most important experiences are perceived with interacting senses and skills, in dynamic systems. Breast milk, for instance, is a mild sedative, so the newborn literally feels happier at Mother's breast, connecting that pleasure with taste, touch, smell, and sight. But in order for all those joys to occur, the infant

ANSWER TO OBSERVATION QUIZ (from page 156): Jumping up, with a three-month age range for acquisition. The reason is that the older an infant is, the more impact both nature and nurture have.



must actively suck at the nipple (an inborn motor skill, which becomes more efficient with practice).

Because of brain immaturity, *cross-modal perception* (using several senses to understand the same experience) is particularly common in young infants. Synesthesia (when a sensation is perceived with more than one sense, as when a sound has a color) is also more common in early infancy, because the various parts of the brain are less distinct (Ozturk et al., 2013).

at about this time

Age Norms (in Months) for Fine Motor Skills

	When 50% of All Babies Master the Skill	When 90% of All Babies Master the Skill
Grasps rattle when placed in hand	3	4
Reaches to hold an object	4.5	6
Thumb and finger grasp	8	10
Stacks two blocks	15	21
Imitates vertical line (drawing)	30	39

Source: World Health Organization, 2006.

Infants respond to motion as well as to sights and sounds. Many new parents soothe their baby's distress by rocking, carrying, or even driving (with the baby in a safety seat) while crooning a lullaby; here again, infant comfort is dynamically connected with social interaction. Massage is especially calming when infants realize that the touch comes from a familiar caregiver who simultaneously provides auditory and visual stimulation. Even vacuuming the carpet with the baby in a sling may quiet a fussy baby because steady noise, changing sights, and carrying combine to soothe distress.

By 6 months, babies have learned to coordinate senses and skills, expecting another person's lip movements to synchronize with speech, for instance (Lewkowicz, 2010). Grabbing, crawling, and walking are dynamic systems that allow exploration, which in turn fosters cognition (Leonard & Hill, 2014).

The time at which walking occurs is a better predictor than age of a child's verbal ability, perhaps because walking children elicit more language from caregivers than crawling ones do (Walle & Campos, 2014). No wonder Piaget linked cognitive and physical development, as Chapter 6 describes.

Cultural Variations

Culture affects every infant move. All healthy infants develop skills in the same sequence, but the age of acquisition varies because each culture encourages certain kinds of practice. When U. S. infants are grouped by ethnicity, generally African American babies are ahead of Latino babies when it comes to walking. In turn, Latino babies are ahead of those of European descent.

Internationally, the earliest walkers are in Africa, where many well-nourished and healthy babies walk at 10 months. The latest walkers may be in rural China (15 months) (Adolph & Robinson, 2013). (Infants prevented from walking, or who are confined to cribs in institutions, walk much later.)

What accounts for normal variation? The power of genes is suggested not only by ethnic differences but also by identical twins, who begin to walk on the same day more often than fraternal twins do. Striking individual differences are apparent in infants' strategies, effort, and concentration in mastering motor skills, again suggesting something inborn (Thelen & Corbetta, 2002).

But much more than genes contribute to variations, as the example that opened this chapter shows. Cultural patterns affect acquisition of every sensory and motor



Bossa Nova Baby? This boy in Brazil demonstrates his joy at acquiring the gross motor skill of walking, which quickly becomes dancing whenever music plays.

skill, with the important of practice evident in hundreds of studies on infant walking (Adolph and Robinson, 2013).

Early reflexes may not fade if culture and conditions allow extensive practice. This has been demonstrated with legs (the stepping reflex), hands (the grasping reflex), and crawling (the swimming reflex). Senses and motor skills are part of a complex and dynamic system in which practice counts (Thelen & Corbetta, 2002). Nutrition makes a difference as well: Both malnourished and overweight children are slower to develop motor skills.

Cross-cultural research finds that some caregivers (including those from Jamaica like Mrs. Todd, who cared for my youngest daughter) provide rhythmic stretching exercises for their infants as part of daily care; their infants are among the world's youngest walkers (Adolph & Berger, 2005). Other cultures discourage or even prevent infants from crawling or walking.

The people of Bali, Indonesia, never let their infants crawl, because babies are considered divine and crawling is for animals (Diener, 2000). Similar reasoning appeared in colonial America, where "standing stools" were designed for children so they could strengthen their legs without sitting or crawling (Calvert, 2003).

By contrast, traditionally the Beng people of the Ivory Coast are proud when their babies start to crawl but do not let them walk until at least 1 year. Although the Beng do not recognize the connection, one reason for this prohibition may be birth control: Beng mothers do not resume sexual relations until their baby takes a first step (Gottlieb, 2000). Another culture with late walkers are the Ache, who live in the jungles of Paraguay, where poisonous snakes could kill a young child. The Ache hold their babies near them day and night; the children first walk on their own at about two years (Adolph & Robinson, 2013).

Although variation in the timing of the development of motor skills is normal, slow development relative to the norm within an infant's culture suggests that attention should be paid: Early visual, auditory, and motor difficulties are much easier to remedy than the same problems discovered later in childhood.

Remember the dynamic systems of senses and motor skills: If one aspect of the system lags behind, the other parts may be affected as well. On the other hand, early walkers are thrilled to have within reach dozens of objects they were unable to explore before—caregivers beware.

SUMMING UP All the senses function at birth, with hearing the most acute sense and vision the least developed. Every sense allows perception to develop and furthers social understanding. Caregivers are soon recognized by sight, touch, smell, and voice. Using both eyes in coordination to understand depth takes several weeks. Pain perception seems less acute for newborns than for older children and adults.

Gross motor skills follow a genetic timetable for maturation; they are also affected by practice and experience. Caregivers and cultures that encourage movement of the infant body in the first months of life are likely to have babies who walk before a year. Fine motor skills also develop with time and experience, combining with the senses as part of dynamic systems. Mouth skills precede finger skills, although both are immature in the early months and years. All the skills are practiced relentlessly as soon as possible, advancing learning and thinking.

WHAT HAVE YOU LEARNED?

1. What is the relationship between perception and sensation?
2. What particular sounds and patterns do infants pay attention to?
3. How does an infant's vision change over the first year?

4. What is universal and what is cultural in the development of gross motor skills in infancy?
5. Why do infants develop fine motor skills using their fingers later than gross motor skills?

Surviving in Good Health

Although precise worldwide statistics are unavailable, the United Nations estimates that more than 8 billion children were born between 1950 and 2015. Almost a billion of them died before age 5.

Although most of those 1 billion deaths could have been prevented, far more would have died without recent public health measures. In 1950 1 young child in 5 died, but only about 1 child in 20 is projected to die in 2014 (United Nations, 2015). In earlier centuries, more than half of all newborns died in infancy. Those are official statistics; probably millions more died without being counted.

Better Days Ahead

In the twenty-first century in developed nations, 99.9 percent of newborns who survive the first month live to adulthood. Even in the poorest nations, where a few decades ago infant mortality was accepted as part of the human experience, 99 percent of newborns who survive those early days live at least until age 15, although the rate of newborn death is much higher than it would be with good medical care. Some nations have seen dramatic improvement. Chile's rate of infant mortality, for instance, was almost 4 times higher than the rate in the United States in 1970; now the two rates are even (see Figure 5.7).

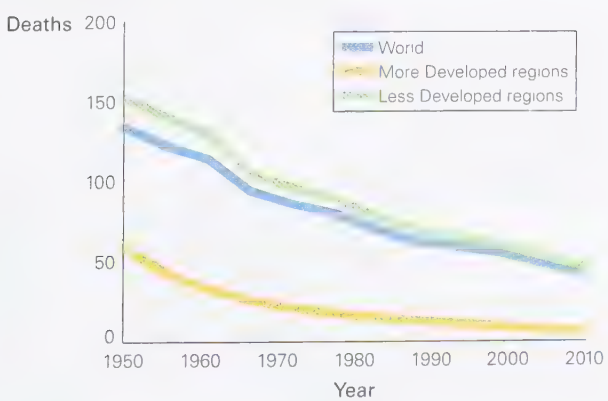
The world death rate in the first five years of life has dropped about 2 percent per year since 1990, (Rajaratnam et al., 2010) with the rate in developed nations less than 1 in 1,000, and in least developed nations about 1 in 200. Public health measures (clean water, nourishing food, immunization) deserve most of the credit.

As children survive, parents focus more effort and income on each child, having fewer children overall. That advances the national economy, which allows for better schools and health care. Infant survival and maternal education are the

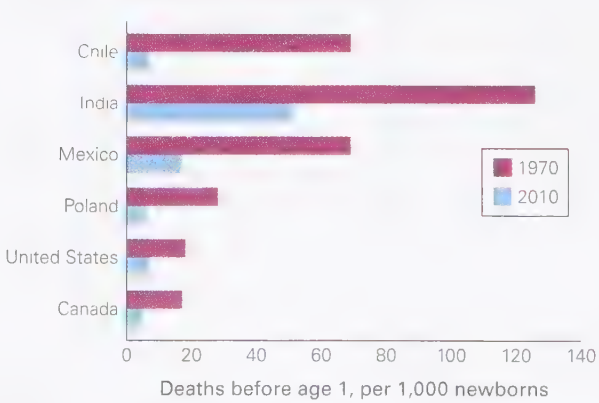
FIGURE 5.7

More Babies Are Surviving Improvements in public health—better nutrition, cleaner water, more widespread immunization—over the past three decades have meant millions of survivors. In some of the very least developed nations (e.g., Malawi) rates are still 1 in 100.

(a) Infant Deaths per 1,000 Births



(b) Infant Mortality Rates: 1970 and 2010



Source: United Nations, 2013.



two main reasons the world's fertility rate in 2010 was half the 1950 rate. This is found in data from numerous nations, especially developing ones, where educated women have far fewer children than those who are uneducated (de la Croix, 2013).

If there were enough public health professionals, the current newborn and child death rate could be cut in half again. Public health measures help parents as well as children, via better food distribution, less violence, more education, cleaner water, and more widespread immunization (Farahani et al., 2009).

Well Protected Disease and early death are common in Africa, where this photo was taken, but neither is likely for 2-year-old Salem. He is protected not only by the nutrition and antibodies in his mother's milk but also by the large blue net that surrounds them. Treated bed nets, like this one provided by the Carter Center and the Ethiopian Health Ministry, are often large enough for families to eat, read, as well as sleep together, without fear of malaria-infected mosquitoes.

a case to study

Scientist at Work

Susan Beal, a young scientist with four children, studied SIDS deaths in Australia for years, responding to phone calls, often at 5 or 6 A.M., that another baby had died. At first she felt embarrassed to question the parents, sometimes arriving before the police or the coroner. But parents were grateful to know that someone was trying to understand the puzzle that had just killed their infant. She realized that parents tended to blame themselves and each other, so she sought to get them talk to each other, as she reassured them that scientists shared their bewilderment. (Scan the QR code below with your smartphone to watch a short interview with Susan Beal.)

As a scientist, she noted dozens of circumstances at each death. Some things did not matter (such as birth order), others increased the risk (maternal smoking and lambskin blankets). A breakthrough came when Beal noticed an ethnic variation: Australian babies of Chinese descent died of SIDS far less often than did those of European descent. Genetic? Most experts thought so. But Beal noticed that almost all SIDS babies were sleeping on their stomachs, contrary to the Chinese custom of placing infants on their backs to sleep. She developed a new hypothesis: Sleeping position mattered.

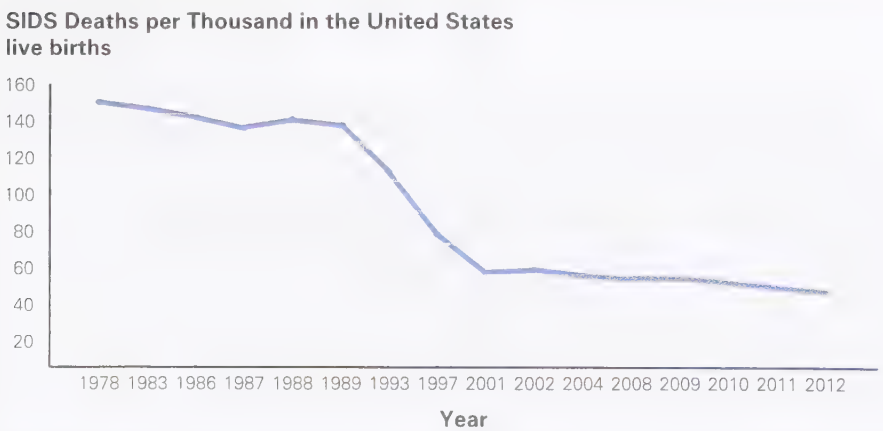


FIGURE 5.8

Alive Today As more parents learn that a baby should be on his or her "back to sleep," the SIDS rate continues to decrease. Other factors are also responsible for the decline—fewer parents smoke cigarettes in the baby's room.

SOURCES: NATIONAL VITAL STATISTICS REPORTS *FORTHCOMING*; HOYERT & XU, 2012; MURPHY ET AL., 2012; KOCHANEK ET AL., 2011; MINO ET AL., 2007; HOYERT ET AL., 2006; 2003; HOYERT ET AL., 1999; GARDNER & HUDSON, 1996; MACDORMAN & ROSENBERG, 1993; MONTHLY VITAL STATISTICS REPORT, 1980

http://www.youtube.com/watch?v=ZIPt5q2QJ9I



INNA ASTAKHOVA/SHUTTERSTOCK



Considering Culture

Often cultural variations are noted in infant care. There are many ways to care for a baby, with all the experience-dependent versions of child care designed to raise children who are prepared for their culture. One theme of this book, as introduced in Chapter 1, it that difference is not deficit. Usually variations are simply alternative ways to meet basic infant needs for nutrition, love, and care.

Sometimes, however, one mode of infant care is much better than another, and here a cross-cultural perspective is especially useful, as evidenced in research about **sudden infant death syndrome (SIDS).**

sudden infant death syndrome (SIDS) A situation in which a seemingly healthy infant, usually between 2 and 6 months old, suddenly stops breathing and dies unexpectedly while asleep.

Every year until the mid-1990s, tens of thousands of infants died of SIDS, called *crib death* in North America and *cot death* in England. Tiny infants smiled at their caregivers, waved their arms at rattles that their small fingers could not yet grasp, went to sleep seemingly healthy, and never woke up. As parents mourned, scientists asked why, testing hypotheses (the cat? the quilt? natural honey? homicide? spoiled milk?) to no avail. Sudden infant death was a mystery. To some extent, it still is, but one risk factor—sleeping on the stomach—is now known worldwide, thanks to the work of one scientist, as described in A Case to Study.

To test her hypothesis, Beal convinced a large group of non-Chinese parents to put their newborns to sleep on their backs. Almost none of them died suddenly. After several years of gathering data, she drew a surprising conclusion: Back-sleeping protected against SIDS. Her published reports (Beal, 1988) caught the attention of doctors in the Netherlands, where pediatricians had told parents to put their babies to sleep on their stomachs. Two Dutch scientists (Engelberts & de Jonge, 1990) recommended back-sleeping; thousands of parents took heed. SIDS was reduced in Holland by 40 percent in one year—a stunning replication.

No SIDS Allowed For centuries, Native-American babies, such as this boy in Arizona, slept on their backs in cradle boards. Back-sleeping was also customary among the Navaho's genetic ancestors, in Asia, protecting them from SIDS.



GALE ZUCKER/AURORA PHOTOS/ALAMY

Replication and application spread. By 1994, a "Back to Sleep" campaign in nation after nation cut the SIDS rate dramatically (Kinney & Thach, 2009; Mitchell, 2009). In the United States in 1984 SIDS killed 5,245 babies; in 1996, that number was down to 3,050; in 2011 it was 1,910 (see Figure 5.8). Such results indicate that, in the United States alone, about 40,000 children and young adults are alive today who would be dead if they had been born before 1990. The campaign has been so successful that physical therapists report that babies now crawl later than they used to; they therefore advocate *tummy time*—putting awake infants on their stomachs to develop their muscles (Zachry & Kitzmann, 2011).

Stomach-sleeping is a proven, replicated risk, but it is not the only one: SIDS still occurs. Beyond sleeping position, other risks include low birthweight, being male, parents who smoke cigarettes, soft blankets or pillows, winter, bed-sharing, abnormalities in the brainstem, the heart, the mitochondria, and the microbiome (Neary & Breckenridge, 2013; Ostfeld et al., 2010). Most SIDS victims experience several risks, suggesting again a cascade of biological and social circumstances.

That does not surprise Susan Beal, who quickly realized that SIDS victims are found in many kinds of households, rich and poor, native-born and immigrant. She sifted through all the evidence and found the main risk—stomach-sleeping—but she has continued to study other factors. She praises the courage of the hundreds of parents who talked with her hours after their baby died.

Immunization

immunization A process that stimulates the body's immune system by causing production of antibodies to defend against attack by a particular contagious disease. Creation of antibodies may be accomplished either naturally (by having the disease), by injection, by drops that are swallowed, or by a nasal spray. (These imposed methods are also called *vaccination*.)

- **Immunization** primes the body's immune system to resist a particular disease. Immunization (often via *vaccination*) may have had "a greater impact on human mortality reduction and population growth than any other public health intervention besides clean water" (J. P. Baker, 2000, p. 199). Within the past 50 years, immunization eliminated smallpox and dramatically reduced chickenpox, flu, measles, mumps, pneumonia, polio, rotavirus, tetanus, and whooping cough. Now scientists seek to immunize against HIV/AIDS, malaria, Ebola, and other viral diseases.

Immunization protects not only from temporary sickness but also from complications, including deafness, blindness, sterility, and meningitis. Sometimes the damage from illness is not apparent until decades later. Having mumps in childhood, for instance, can cause sterility and doubles the risk of schizophrenia in adulthood (Dalman et al., 2008).

Some people cannot be safely immunized, including the following:

- Embryos, who may be born blind, deaf, and brain-damaged if their pregnant mother contracts rubella (German measles)
- Newborns, who may die from a disease that is mild in older children
- People with impaired immune systems (HIV-positive, aged, or undergoing chemotherapy), who can become deathly ill



True Dedication This young Buddhist monk lives in a remote region of Nepal, where, until recently, measles was a fatal disease. Fortunately, a UNICEF porter carried the vaccine over mountain trails for two days so that this boy—and his whole community—could be immunized.

Fortunately, each vaccinated child stops transmission of the disease and thus protects others, a phenomenon called *herd immunity* (mentioned in Chapter 1). Although specifics vary by disease, usually if 90 percent of the people in a community (a herd) are immunized, the disease does not spread. Without herd immunity, some community members die of a "childhood" disease.

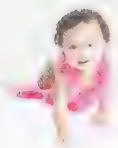
Everywhere parents can refuse to vaccinate their children for medical reasons, but in 19 states of the United States, parents are able to opt out of vaccination because of "personal belief" (Blad, 2014). In Colorado, for instance, 15 percent of all kindergartners have never been immunized against measles, mumps, rubella, diphtheria, tetanus, or whooping cough. That is below herd immunity, and an epidemic could occur—with infants most likely to suffer.

Problems with Immunization

Infants may react to immunization by being irritable or even feverish for a day or so, to the distress of their parents. However, parents do not notice if their child does *not* get polio, measles, or so on. Before the varicella (chicken pox) vaccine, more than 100 people in the United States died each year from that disease, and 1 million were itchy and feverish for a week. Now almost no one dies of varicella, and far fewer get chicken pox.

Many parents are concerned about the potential side effects of vaccines. Whenever something seems to go amiss with vaccination, the media broadcast it, which frightens parents. This has occurred particularly as rates of autism have risen. (**Developmental Link:** The link between fear of immunization and increased rates of autism is discussed in A View from Science in Chapter 1.) As a result, the rate of missed vaccinations in the United States has been rising over the past decade. This horrifies public health workers, who, taking a longitudinal and society-wide perspective, realize that the risks of the diseases are far greater than the risks

Especially for Nurses and Pediatricians A mother refuses to have her baby immunized because she wants to prevent side effects. She wants your signature for a religious exemption, which in some jurisdictions allows the mother to refuse vaccination. What should you do? (see response, page 167)



from immunization. The 2014 spike in measles cases was the highest since 1994, one result of increasing numbers of parents objecting to vaccination.

Concerns about safety are greatest for newer vaccines, including the annual flu shot. Pregnant women and young children are particularly likely to be seriously affected by flu, which has led the United States Centers for Disease Control to recommend vaccination. However, most pregnant women and about 30 percent of parents do not follow that recommendation (MMWR, March 7, 2014).

In 2012, two states, Connecticut and New Jersey, required flu vaccination for all 6- to 59-month-olds in licensed day-care centers. Flu immunization rates of young Connecticut children rose from 68 to 84 percent. In the 2012–2013 winter, far fewer young children in Connecticut were hospitalized for flu than in previous years, although rates rose everywhere else. Since most Connecticut children are not in day care, apparently herd immunity, added to the perception of parents that flu vaccination was safe, was protective. Meanwhile, Colorado had the highest rate of flu hospitalizations, an increase from previous years (MMWR, March 7, 2014).

LaunchPad



Video: Nutritional Needs of Infants and Children: Breast Feeding Promotion shows UNICEF's efforts to educate women on the benefits of breastfeeding.

Nutrition

As already explained, infant mortality worldwide has plummeted in recent years for several reasons: fewer sudden infant deaths, advances in prenatal and newborn care, and, as you just read, immunization. One more measure is making a huge difference: better nutrition.

Breast Is Best

Ideally, nutrition starts with *colostrum*, a thick, high-calorie fluid secreted by the mother's breasts at birth. After about three days, the breasts begin to produce milk.

Compared with formula based on cow's milk, human milk is sterile, always at body temperature, and rich in many essential nutrients for brain and body (Wambach & Riordan, 2014; Drover et al., 2009). Babies who are exclusively breast-fed are less often sick, partly because breast milk provides antibodies and decreases allergies and asthma. Disease protection continues lifelong: Babies who are exclusively breast-fed in the early months become obese less often (Huh et al., 2011) and thus have lower rates of diabetes and heart disease.

Breast-feeding is especially protective for preterm babies; if a tiny baby's mother cannot provide breast milk, physicians recommend milk from another woman (Schanler, 2011). (Once a woman has given birth, her breasts can continue to produce milk for decades.)

The specific fats and sugars in breast milk make it more digestible and better for the brain than any substitute (Drover et al., 2009; Wambach & Riordan, 2014). The composition of breast milk adjusts to the age of the baby, with milk for premature babies distinct from that for older infants. Quantity increases to meet the demand: Twins and even triplets can be exclusively breast-fed for months.

Formula is preferable only in unusual cases, such as when the mother is HIV-positive or uses toxic or addictive drugs. Even then, however, breast milk without supplementation may be advised, depending on the alternatives. For example, in some African nations, HIV-positive women are encouraged to breast-feed because infants' risk of catching HIV from their mothers is lower than the risk of dying from infections, diarrhea, or malnutrition as a result of bottle-feeding (Cohen,



BARTOSZ HADYNIAK/GETTY IMAGES



Same Situation, Far Apart: Breast-Feeding Breast-feeding is universal None of us would exist if our fore-mothers had not successfully breast-fed their babies for millennia. Currently, breast-feeding is practiced worldwide, but it is no longer the only way to feed infants, and each culture has particular practices

Do You Believe It?
This table lists so many advantages that some skepticism seems warranted. However, every item on this list arises from research that considers confounding factors, such as the mother's health and education. It may be that breast milk is truly a miracle food.

TABLE 5.1 The Benefits of Breast-Feeding

For the Baby	For the Mother
Balance of nutrition (fat, protein, etc.) adjusts to age of baby	Easier bonding with baby
Breast milk has micronutrients not found in formula	Reduced risk of breast cancer and osteoporosis
Less infant illness, including allergies, ear infections, stomach upsets	Natural contraception (with exclusive breast-feeding, for several months)
Less childhood asthma	Pleasure of breast stimulation
Better childhood vision	Satisfaction of meeting infant's basic need
Less adult illness, including diabetes, cancer, heart disease	No formula to prepare; no sterilization
Protection against many childhood diseases, since breast milk contains antibodies from the mother	Easier travel with the baby
Stronger jaws, fewer cavities, advanced breathing reflexes (less SIDS)	**For the Family**
Higher IQ, less likely to drop out of school, more likely to attend college	Increased survival of other children (because of spacing of births)
Later puberty, fewer teenage pregnancies	Increased family income (because formula and medical care are expensive)
Less likely to become obese or hypertensive by age 12	Less stress on father, especially at night

Sources: Beilin & Huang, 2008, Riordan & Wambach, 2009, Schanler, 2011, U.S. Department of Health and Human Services, 2011

2007; Kuhn et al., 2009). The worst option in that circumstance is a mixture of breast- and formula-feeding.

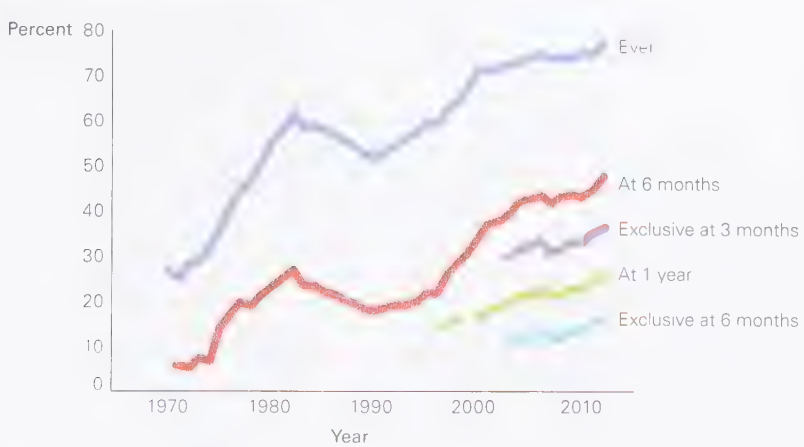
Doctors worldwide recommend breast-feeding with no other foods—not even juice—for the first months of a newborn's life. (Table 5.1 lists some of the benefits of breast-feeding.) Some pediatricians suggest adding foods (rice cereal and bananas) at 4 months; others want mothers to wait until 6 months (Fewtrell et al., 2011). For breast milk to meet the baby's nutritional needs, the mother must be well fed and hydrated (especially important in hot climates), and avoid alcohol, cigarettes, and other drugs.

Breast-feeding was once universal, but by the mid-twentieth century many mothers thought formula was better. Fortunately, that has changed again. In the United States, 77 percent of infants are breast-fed at birth, 48 percent at 6 months (most with other food as well), and 25 percent at a year (virtually all with other food and drink) (U.S. Department of Health and Human Services, 2011) (see Figure 5.10). Worldwide, about half of all 2-year-olds are still nursing, usually at night.

Encouragement of breast-feeding and help from family members, especially new fathers, are crucial. Ideally, nurses visit new mothers weekly at home; such visits (routine in some nations, rare in others) increase the likelihood that breast-feeding will continue. It is also true that, as with many aspects of child care, "there may be little net benefit to breast-feeding if it results

FIGURE 5.10
A Smart Choice In 1970, educated women were taught that formula was the smart, modern way to provide nutrition—but no longer. Today, more education for women correlates with more breast milk for babies. About half of U.S women with college degrees now manage three months of *exclusive* breast-feeding—no juice, no water, and certainly no cereal.

U.S. Trends in Breast-Feeding Rates



Source: Centers for Disease Control and Prevention, 2012 and previous years

in distressed mothers or marital or family discord" (Brody, 2012). In other words, "breast is best" when compared to formula, but exclusive breast-feeding is not always best when a family's entire life together is considered. In developed nations, sterile formula has nourished millions of infants, who have become happy and healthy children.

Malnutrition

Protein-calorie malnutrition occurs when a person does not consume enough food to sustain normal growth. This form of malnutrition affects roughly one-fourth of the world's children in developing nations: They suffer from **stunting,** being short for their age because chronic malnutrition kept them from growing. Stunting is most common in the poorest nations (see Figure 5.11).

Even worse is **wasting,** when children are severely underweight for their age and height (2 or more standard deviations below average). Many nations, especially in East Asia, Latin America, and central Europe, have seen improvement in child nutrition in the past decades, with an accompanying decrease in wasting and stunting.

protein-calorie malnutrition A condition in which a person does not consume sufficient food of any kind. This deprivation can result in several illnesses, severe weight loss, and even death.

stunting The failure of children to grow to a normal height for their age due to severe and chronic malnutrition.

wasting The tendency for children to be severely underweight for their age as a result of malnutrition.





Same Situation, Far Apart: Children Still Malnourished Infant malnutrition is common in refugees (like this baby now living in Thailand, *right*) or in countries with conflict or crop failure (like Niger, at *left*). Relief programs reach only some of the children in need around the world. The children in these photographs are among the lucky ones who are being fed.

In some other nations, however, primarily in Africa, wasting has increased. And in several nations in South Asia, about one-third of young children are stunted (World Health Organization, 2014). In some nations, the traditional diet for young children or their mothers does not provide sufficient vitamins, fat, and protein for robust health (Martorell & Young, 2012). As a result, the infant's energy is reduced and normal curiosity is absent (Osorio, 2011). Young children naturally want to do whatever they can: A child with no energy is a child who is not learning.

Chronically malnourished infants and children suffer in three additional ways:

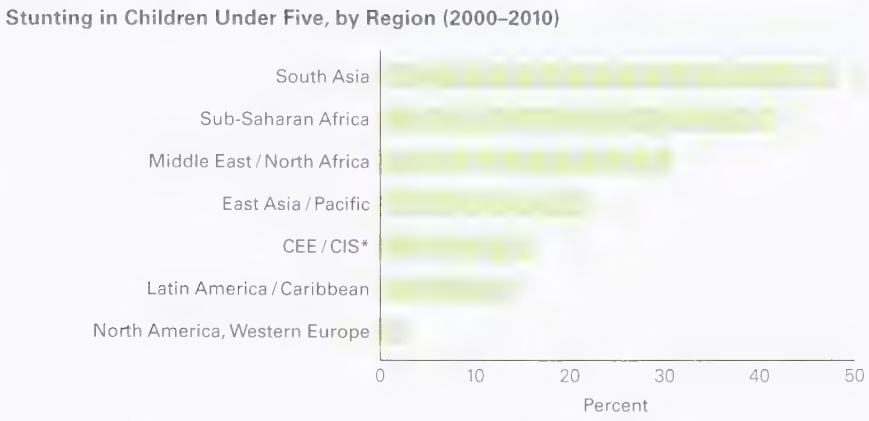
1. Their brains may not develop normally. If malnutrition has continued long enough to affect height, it may also have affected the brain.
2. Malnourished children have no body reserves to protect them against common diseases. About half of all childhood deaths occur because malnutrition makes a childhood disease lethal.
3. Some diseases result directly from malnutrition—both **marasmus** during the first year, when body tissues waste away, and **kwashiorkor** after age 1, when growth slows down, hair becomes thin, skin becomes splotchy, and the face, legs, and abdomen swell with fluid (edema).

Prevention, more than treatment, is needed. Sadly, some children hospitalized for marasmus or kwashiorkor die even after feeding because their digestive systems

// **Response for Nurses and Pediatricians** (from page 164): It is difficult to convince people that their method of child rearing is wrong, although you should try. In this case, listen respectfully and then describe specific instances of serious illness or death from a childhood disease. Suggest that the mother ask her grandparents if they knew anyone who had polio, tuberculosis, or tetanus (they probably did). If you cannot convince this mother, do not despair: Vaccination of 95 percent of toddlers helps protect the other 5 percent. If the mother has genuine religious reasons, talk to her clergy adviser.

marasmus A disease of severe protein-calorie malnutrition during early infancy, in which growth stops, body tissues waste away, and the infant eventually dies

kwashiorkor A disease of chronic malnutrition during childhood, in which a protein deficiency makes the child more vulnerable to other diseases, such as measles, diarrhea, and influenza.



*Refer to Central and Eastern Europe (CEE) and Commonwealth of Independent States (CIS), which together comprise the countries of central Europe as well as those of the former Soviet Union

Source: UNICEF, 2012.

FIGURE 5.11

Genetic? The data show that basic nutrition is still unavailable to many children in the developing world. Some critics contend that Asian children are genetically small and therefore that Western norms make it appear as if India and Africa have more stunted children than they really do. However, children of Asian and African descent born and nurtured in North America are as tall as those of European descent. Thus, malnutrition, not genes, accounts for most stunting worldwide.

are already failing (M. Smith et al., 2013). Ideally, prenatal nutrition, then breast-feeding, and then supplemental iron and vitamin A stop malnutrition before it starts. Once malnutrition is apparent, highly nutritious formula (usually fortified peanut butter) often restores weight—but not always.

Some severely malnourished children still die. Researchers believe that for them, a combination of factors—genetic susceptibility, poor nutrition, infection, and abnormal bacteria in the digestive system (the microbiome)—is fatal (M. Smith et al., 2013). Giving severely ill children an antibiotic to stop infection saves lives—but always, prevention is best (Gough et al., 2014).

A study of two very poor African nations (Niger and Gambia) found several specific factors that reduced the likelihood of wasting and stunting: breast-feeding, both parents at home, water piped to the house, a tile (not dirt) floor, a toilet, electricity, immunization, a radio, and the mother's secondary education (Oyekale & Oyekale, 2009). Overall, "a mother's education is key in determining whether her children will survive their first five years of life" (United Nations, 2011, p. 26).

Several items on this list are taken for granted by readers of this book. However, two themes apply to everyone at any age: (1) Prevention is better than treatment, and (2) people with some knowledge tend to protect their health and that of their family. The next chapters continue these themes.

SUMMING UP Various public health measures have saved billions of infants in the past century. Immunization protects those who are inoculated and also halts the spread of contagious diseases (via herd immunity). Smallpox has been eliminated, and many other diseases are rare except in regions of the world where public health professionals have not been able to establish best practices. In the United States, success at reducing childhood diseases have led some parents to refuse immunization completely, which may lead to an epidemic if herd immunity falls too low.

Breast milk is the ideal infant food, improving development for decades and reducing infant malnutrition and death. Fortunately, rates of breast-feeding are increasing in developing nations; most underdeveloped nations have always had high rates of breast-feeding. Malnutrition has not been eliminated, however. If a breast-feeding mother is severely malnourished, or if a toddler does not get sufficient nourishment, diseases flourish and learning diminishes. In some parts of the world, children still suffer from stunting and wasting, which are the most visible results of malnutrition.

LaunchPad



COURTESY OF UNICEF

Video: Malnutrition and Children in Nepal shows the plight of children in Nepal who suffer from protein energy malnutrition (PEM).

WHAT HAVE YOU LEARNED?

1. Why are immunization rates low in some African and South Asian nations?
2. Why do doctors worry about immunization rates in the United States?
3. What are the reasons for and against breast-feeding until a child is at least 1 year old?
4. What is the relationship between malnutrition and disease?
5. As an indication of malnutrition, which is better, stunting or wasting? Why?

SUMMARY

Body Changes

1. In the first two years of life, infants grow taller, gain weight, and increase in head circumference—all indicative of development. Birthweight doubles by 4 months, triples by 1 year, and quadruples by 2 years.
2. Medical checkups in the first months of a child's life focus especially on weight, height, and head circumference, because early detection of slow growth can halt later problems.
3. The amount of time a child sleeps gradually decreases over the first two years. Bed-sharing is the norm in many developing nations, and co-sleeping is increasingly common in developed ones.

Brain Development

4. Brain size increases dramatically, from about 25 to 75 percent of the adult brain's weight in the first two years. Complexity increases as well, with cell growth, development of dendrites, and formation of synapses. Both growth and pruning aid cognition.
5. Experience is vital for brain development. An infant who is socially isolated, over-stressed, or deprived of stimulation may be impaired lifelong.

Perceiving and Moving

6. At birth, the senses already respond to stimuli. Prenatal experience makes hearing the most mature sense. Vision is the least mature sense at birth, but it improves quickly. Infants use all their senses to strengthen their early social interactions.
7. Infants gradually improve their motor skills as they begin to grow and brain maturation continues. Gross motor skills are soon evident, from rolling over to sitting up (at about 6 months), from standing to walking (at about 1 year), from climbing to running (before age 2).
8. Babies gradually develop the fine motor skills to grab, aim, and manipulate almost anything within reach. Experience, time, motivation, and practice allow infants to advance in all their motor skills.

Surviving in Good Health

9. About 2 billion infant deaths have been prevented in the past half-century because of improved health care. One major innovation is immunization, which has eradicated smallpox and virtually eliminated polio and measles. More medical professionals are needed to prevent, diagnose, and treat the diseases that still cause many infant deaths in poor nations.
10. Breast-feeding is best for infants, partly because breast milk helps them resist disease and promotes growth of every kind. Most babies are breast-fed at birth, but in North America only half are breast-fed at six months, and few of those are exclusively breast-fed, as doctors worldwide recommend.
11. Severe malnutrition stunts growth and can cause death, both directly through marasmus or kwashiorkor and indirectly through vulnerability if a child catches measles, an intestinal virus, or some other illness.

KEY TERMS

percentile (p. 138)
failure to thrive (p. 138)
REM (rapid eye movement) sleep (p. 139)
co-sleeping (p. 140)
bed-sharing (p. 140)
head-sparing (p. 142)
neuron (p. 142)
cortex (p. 143)
prefrontal cortex (p. 143)
axon (p. 143)
dendrite (p. 143)
synapse (p. 143)
neurotransmitter (p. 143)
synaptic gap (p. 143)
transient exuberance (p. 145)
pruning (p. 145)
experience-expectant (p. 146)
experience-dependent (p. 146)
shaken baby syndrome (p. 149)
self-righting (p. 151)
sensation (p. 152)
perception (p. 152)
binocular vision (p. 154)
motor skills (p. 156)
gross motor skills (p. 156)
fine motor skills (p. 157)
sudden infant death syndrome (SIDS) (p. 163)
immunization (p. 164)
protein-calorie malnutrition (p. 167)
stunting (p. 167)
wasting (p. 167)
marasmus (p. 167)
kwashiorkor (p. 167)

APPLICATIONS

1. Immunization regulations and practices vary, often for social and political reasons. Ask at least two faculty or administrative staff members what immunizations the students at your college must have and why. If you hear, "It's a law," ask why.
2. Observe three infants (whom you do not know) in public places such as a store, playground, or bus. Look closely at body size and motor skills. From that, estimate the age in months, and then ask the caregiver how old the infant is.
3. Ask three to ten adults whether they were bottle-fed or breast-fed and, if breast-fed, for how long. Any correlation with body size, health?



LEFT: JOSE LUIS PELAEZ INC/BLEND IMAGES/GETTY IMAGE
TOP RIGHT: © JOHN LUND/ANNABELLE BREAKEY/BLEND IMAGES/CORB

CHAPTER 6



The First Two Years: Cognitive Development

1. Why did Piaget compare 1-year-olds to scientists?
2. Why isn't Piaget's theory of sensorimotor intelligence universally recognized as insightful?
3. What factors influence whether infants remember what happens to them before they can talk?
4. When and how do infants learn to talk?

- Sensorimotor Intelligence
  - Stages One and Two: Primary Circular Reactions
  - Stages Three and Four: Secondary Circular Reactions
  - Stages Five and Six: Tertiary Circular Reactions
  - A VIEW FROM SCIENCE: Piaget and Modern Research
- Information Processing
  - Affordances
  - Memory
- Language: What Develops in the First Two Years?
  - The Universal Sequence
  - First Words
  - Cultural Differences
  - Theories of Language Learning
  - OPPOSING PERSPECTIVES: Language and Video

"You've been flossing more," the hygienist told me approvingly after she cleaned my teeth. Hurray, I am happy that she noticed. I never flossed as a child (did flossing exist then?) and I have rarely flossed in adulthood (I had no time, I rationalized) but for the past two months I have been flossing every morning. This change of behavior was primarily cognitive. First I read research that found a negative correlation between flossing and heart disease. Then I applied several techniques of behavior modification to myself. I am glad this new daily action accumulated to something remarkable.

But then she made excessive demands.

"You need to brush three minutes each time, and floss twice a day."

"Why?"

"You will have less tartar."

"What is wrong with tartar?"

"It causes gingivitis."

"What is wrong with gingivitis?"

"It causes periodontitis."

"What is wrong with periodontitis?"

She looked at me as if I were incredibly stupid, and said, "It is terrible, it is expensive, it is time-consuming. You could lose a tooth."

I could have asked what's wrong with losing a tooth. Instead I was quiet.

How does this apply to infant cognitive development? The cascade of events, from another minute of daily brushing to a tooth lost forever, is not unlike the cascade that transforms a newborn into a talking, goal-directed 2-year-old. Infants learn each day, from their first attempt to suck and swallow to their comprehension of some laws of physics, from recognition of Mother's voice to memory for action sequences they have witnessed, from a reflexive cry to deliberate sentences.

Each day of looking and learning seems insignificant, yet responses accumulate to develop a toddler who thinks, understands, pretends, and explains. This chapter

describes in detail those early days and months, which build the intellectual foundation for later thinking and talking. Nurture is not the only influence, of course; maturation is crucial too, but nurture is crucial.

Newborns seem to know nothing. Two years later they can make a wish, say it out loud, and blow out their birthday candles. Thousands of developmentalists have traced this rapid progression, finding that preverbal infants understand much more than adults once realized and that every day brings new cognitive development, guided by experience.

This chapter begins with Piaget, specifically his six stages of intellectual progression over the first two years. We then describe another approach to understanding infant cognition, information processing, with some intriguing research that uses methods such as habituation and brain scans and reveals preverbal memory and communication. The most dramatic evidence of early intellectual growth—talking fluently or haltingly in whatever language the caregivers choose—is then described.

The final topic of this chapter may be most important: What is the best way to nurture early cognition? Do developmentalists know answers that other people need to know?

Sensorimotor Intelligence

As you remember from Chapter 2, Jean Piaget was a Swiss scientist who earned his doctorate in 1918, when most scientists thought infants ate, cried, and slept but did not yet learn. When Piaget became a father, he used his scientific observa-

TABLE 6.1 The Six Stages of Sensorimotor Intelligence

For an overview of the stages of sensorimotor thought, it helps to group the six stages into pairs.

The first two stages involve the infant's responses to its own body.

Primary Circular Reactions

Stage One (birth to 1 month)	*Reflexes:* sucking, grasping, staring, listening
Stage Two (1–4 months)	*The first acquired adaptations:* accommodation and coordination of reflexes *Examples:* sucking a pacifier differently from a nipple; attempting to hold a bottle to suck it

The next two stages involve the infant's responses to objects and people.

Secondary Circular Reactions

Stage Three (4–8 months)	*Making interesting sights last:* responding to people and objects *Example:* clapping hands when mother says "patty-cake"
Stage Four (8–12 months)	*New adaptation and anticipation:* becoming more deliberate and purposeful in responding to people and objects *Example:* putting mother's hands together in order to make her start playing patty-cake

The last two stages are the most creative, first with action and then with ideas.

Tertiary Circular Reactions

Stage Five (12–18 months)	*New means through active experimentation:* experimentation and creativity in the actions of the "little scientist" *Example:* putting a teddy bear in the toilet and flushing it
Stage Six (18–24 months)	*New means through mental combinations:* thinking before doing, new ways of achieving a goal without resorting to trial and error. *Example:* before flushing the teddy bear, hesitating because of the memory of the toilet overflowing and mother's anger

tion skills with his own babies. Contrary to conventional wisdom, he realized that infants are active learners, adapting to experience. His theories and observations have earned Piaget the admiration of developmentalists ever since. (**Developmental Link:** Piaget's theory of cognitive development is introduced in Chapter 2.)

Piaget called cognition in the first two years **sensorimotor intelligence,** named about the early senses and motor skills described in Chapters 4 and 5. Those early reflexes and body movements are used by infants to develop their minds, adapting to experience. Sensorimotor intelligence is subdivided into six stages (see Table 6.1).

Video: Sensorimotor Intelligence in Infancy and Toddlerhood
http://qrs.ly/lj4ep00



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Stages One and Two: Primary Circular Reactions

In every aspect of sensorimotor intelligence, the brain and the senses interact with experiences, each shaping the other as part of a dynamic system (Ambady & Bharucha, 2009). Piaget described the interplay of sensation, perception, and cognition as *circular reactions,* emphasizing that, as in a circle, there is no beginning and no end. Each experience leads to the next, which loops back (see Figure 6.1). The first two stages of sensorimotor intelligence are **primary circular reactions,** involving the infant's body.

Stage one, called the *stage of reflexes,* lasts only a month. It includes senses as well as motor reflexes, the foundations of sensorimotor thought. Soon reflexes become deliberate actions; sensation leads to perception, perception leads to cognition, and then cognition leads back to sensation.

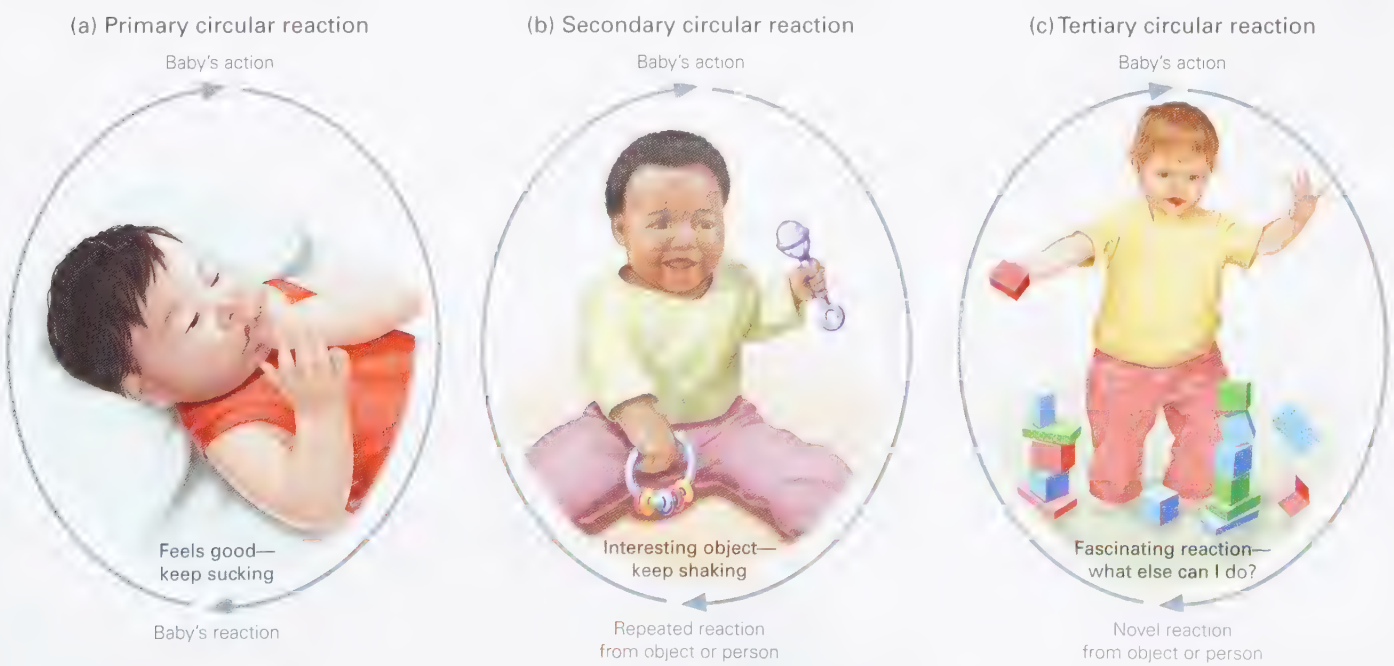
Stage two, *first acquired adaptations* (also called *stage of first habits*), begins because reflexes adjust to whatever responses they elicit. Adaptation is cognitive; it includes both assimilation and accommodation. (**Developmental Link:** Assimilation and accommodation are explained in Chapter 2.) Infants adapt their reflexes as their responses teach them about what the body does and how each action feels.

Here is one example. In a powerful reflex, full-term newborns suck anything that touches their lips. Their first learning challenge is to suck, swallow, and suck

sensorimotor intelligence Piaget's term for the way infants think—by using their senses and motor skills—during the first period of cognitive development.

primary circular reactions The first of three types of feedback loops in sensorimotor intelligence, this one involving the infant's own body. The infant senses motion, sucking, noise, and other stimuli and tries to understand them.

FIGURE 6.1
Never Ending Circular reactions keep going because each action produces pleasure that encourages more action.





VLADIMIR GODNYK/GETTY IMAGES

Time for Adaptation Sucking is a reflex at first, but adaptation begins as soon as an infant differentiates a pacifier from her mother's breast or realizes that her hand has grown too big to fit into her mouth. This infant's expression of concentration suggests that she is about to make that adaptation and suck just her thumb from now on.

again without spitting up too much—a major task that often takes a few days, with the mother learning how to help her baby latch, suck, and swallow.

During the first stage, in the first month, infants *adapt* their sucking reflex to bottles or breasts, pacifiers or fingers, each requiring specific types of tongue pushing. This adaptation signifies that infants have begun to interpret sensations; as they accommodate, they are "thinking."

During stage two, which Piaget pegged from about 1 to 4 months of age, additional adaptation of the sucking reflex begins. Infant cognition leads babies to suck in some ways for hunger, in other ways for comfort—and not to suck fuzzy blankets or hard plastic. Once adaptation occurs, it sticks.

Adaptation is quite specific. For instance, 4-month-old breast-fed babies may reject milk from the nipple of a bottle if they have never experienced it. Or suppose 4-month-olds have discovered how to suck their thumbs, and have practiced thumb-sucking to their joy and satisfaction. Then suppose the parents decide that a pacifier is better—cleaner, perhaps, or healthier for teeth. That may be too late. Their baby may refuse to readapt, spitting out the pacifier and finding the thumb instead. Piaget believed that people of all ages tend to be stuck in their ways for cognitive reasons; early adaptation is one example.

Stages Three and Four: Secondary Circular Reactions

secondary circular reactions The second of three types of feedback loops in sensorimotor intelligence, this one involving people and objects. Infants respond to other people, to toys, and to any other object they can touch or move.

In stages three and four, development advances from primary to **secondary circular reactions.** Those reactions extend beyond the infant's body; this circular reaction is between the baby and something else.

During stage three (4 to 8 months), infants attempt to produce exciting experiences, *making interesting sights last.* Realizing that rattles make noise, for example, they wave their arms and laugh whenever someone puts a rattle in their hand. The sight of something delightful—a favorite squeaky toy, a smiling parent—can trigger active efforts for interaction.

Especially for Parents When should parents decide whether to feed their baby only by breast, only by bottle, or using some combination of the two? When should they decide whether or not to let their baby use a pacifier? (see response, page 176)

Next comes stage four (8 months to 1 year), *new adaptation and anticipation* (also called the *means to the end*). Babies may ask for help (fussing, pointing, gesturing) to accomplish what they want. Thinking is more innovative because adaptation is more complex. For instance, instead of always smiling at Grandpa, an infant might first assess his mood. Stage-three babies know how to continue an experience; stage-four babies initiate and anticipate.

Pursuing a Goal

An impressive attribute of stage four is that babies work hard to achieve their goals. A 10-month-old girl might crawl over to her mother, bringing a bar of soap as a signal to start her bath, and then start to remove her clothes to make her wishes crystal clear—finally squealing with delight when the bath water is turned on. Similarly, if a 10-month-old boy sees his father putting on his coat to leave, he might drag over his own jacket to signal that he wants to go along.

At that age, babies indicate that they are hungry—and keep their mouths firmly shut if the food on the spoon is something they do not like. If the caregivers have been using sign language, among the first signs learned by 10-month-olds are "eat" and "more." Even without parental signing, babies this age begin displaying some universal signs—pointing, pushing, and reaching up to be held. These cognitive advances benefit from new motor skills (e.g., crawling, grabbing, hand gestures), which result from brain maturation—dynamic systems again.

With a combination of experience and brain maturation, babies become attuned to the goals of others, an ability much more evident at 10 months than 8 months

(Brandone et al., 2014). It seems that at Piaget's fourth stage of sensorimotor intelligence, personal understanding begins to extend to social understanding.

Object Permanence

Piaget thought that, at about 8 months, babies first understand the concept of **object permanence**—the realization that objects or people continue to exist when they are no longer in sight. As Piaget discovered, not until about 8 months do infants search for toys that have fallen from the crib, rolled under a couch, or disappeared under a blanket. Blind babies also acquire object permanence toward the end of their first year, reaching for an object that they hear nearby (Fazzi et al., 2011).

object permanence The realization that objects (including people) still exist when they can no longer be seen, touched, or heard.

As a recent statement of this phenomenon explains:

> Many parents in our typical American middle-class households have tried out Piaget's experiment in situ: Take an adorable, drooling 7-month-old baby, show her a toy she loves to play with, then cover it with a piece of cloth right in front of her eyes. What do you observe next? The baby does not know what to do to get the toy! She looks around, oblivious to the object's continuing existence under the cloth cover, and turns her attention to something else interesting in her environment. A few months later, the same baby will readily reach out and yank away the cloth cover to retrieve the highly desirable toy. This experiment has been done thousands of times and the phenomenon remains one of the most compelling in all of developmental psychology.
>
> *[Xu, 2013, p. 167]*

This excerpt describes Piaget's classic experiment to measure object permanence: An adult shows an infant an interesting toy, covers it with a lightweight cloth, and observes the response. The results:

- Infants younger than 8 months do not search for the object by removing the cloth.
- At about 8 months, infants search removing the cloth immediately after the object is covered but not if they have to wait a few seconds.
- At 18 months, they search quite well, even after a wait, but not if they have seen the object put first in one place and then moved to another. They search in the first place, not the second, a mistake called the *A-not-B error.* Thus they search where they remember seeing it put (A), somehow not understanding that they saw it moved (to B). When a healthy, bright toddler exhibits this obvious failing, observers usually agree with Piaget: A-not-B is a sign of immature brain development, not a lack of innate intelligence.
- By 2 years, children fully understand object permanence, progressing through several stages of ever-advanced cognition (Piaget, 1954/2013).

This research provides many practical suggestions. If young infants fuss because they see something they cannot have (keys, a cell phone, candy), caregivers are advised to put that coveted object out of sight. Fussing stops if object permanence has not yet appeared.

By contrast, for toddlers, hiding a forbidden object is not enough. It must be securely locked up or discarded, lest the child later retrieve it, climbing onto the kitchen counter or under the bathroom sink to do so. Since object permanence develops gradually, peek-a-boo is too advanced in the first months, but it is fun just about the time that object permanence is new. As comprehension of hidden objects matures, peek-a-boo becomes boring, but hide-and-seek becomes fun. Again, take into account the age of the child: At first



Family Fun Peek-a-boo makes all three happy, each for cognitive reasons. The 9-month-old is discovering object permanence, his sister (at the concrete operational stage) enjoys making her brother laugh, and their mother understands more abstract ideas—such as family bonding.

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Response for Parents (from page 174): Both decisions should be made within the first month, during the stage of reflexes. If parents wait until the infant is 4 months or older, they may discover that they are too late. It is difficult to introduce a bottle to a 4-month-old who has never sucked on an artificial nipple or a pacifier to a baby who has already adapted the sucking reflex to a thumb.

hide-and-seek must be quick and simple, with the giggling child hiding in the same obvious place again and again. After a few years, the game can become more elaborate (longer waiting, more imaginative hiding).

Piaget believed that failure to search before 8 months meant that infants had no concept of object permanence—that "out of sight" literally means "out of mind." That belief has been questioned. As one researcher points out, "Amid his acute observation and brilliant theorizing, Piaget . . . mistook infants' motor incompetence for conceptual incompetence" (Mandler, 2004, p. 17).

A series of clever experiments in which objects seemed to disappear behind a screen while researchers traced babies' eye movements and brain activity revealed that long before 8 months, infants are surprised if an object vanishes (Baillargeon & DeVos, 1991; Spelke, 1993). The idea that such surprise indicates object permanence is accepted by some scientists, who believe that "infants as young as 2 and 3 months of age can represent fully hidden objects" (Cohen & Cashon, 2006, p. 224). Other scientists are not convinced (Mareschal & Kaufman, 2012).

Further research on object permanence continues to raise questions and produce surprises. For instance, many other creatures (cats, monkeys, dogs, birds) develop object permanence at younger ages than Piaget found. The animal ability seems to be innate, not learned, as wolves can develop it as well as dogs—but neither is adept at "invisible" displacement, as when an object is moved by a hand underneath a cloth that covers it (Fiset & Plourde, 2013). At a certain age, children figure this out, but dogs do not.

Especially for Parents One parent wants to put all the breakable or dangerous objects away when the toddler is able to move around independently. The other parent says that the baby should learn not to touch certain things. Who is right? (see response, page 179)

Stages Five and Six: Tertiary Circular Reactions

In their second year, infants start experimenting in thought and deed—or, rather, in the opposite sequence, deed and thought. They act first (stage five) and think later (stage six).

tertiary circular reactions The third of three types of feedback loops in sensorimotor intelligence, this one involving active exploration and experimentation. Infants explore a range of new activities, varying their responses as a way of learning about the world.

Tertiary circular reactions begin when 1-year-olds take independent actions to discover the properties of other people, animals, and things. Infants no longer respond only to their own bodies (primary reactions) or to other people or objects (secondary reactions). Their cognition is more like a spiral than a closed circle, increasingly creative with each discovery.

"little scientist" The stage-five toddler (age 12 to 18 months) who experiments without anticipating the results, using trial and error in active and creative exploration.

Piaget's stage five (ages 12 to 18 months), *new means through active experimentation*, builds on the accomplishments of stage four. Now goal-directed and purposeful activities become more expansive.



ARIEL SKELLEY AGE FOTOSTOCK

Exploration at 15 Months One of the best ways to investigate food is to squish it in your hands, observe changes in color and texture, and listen for sounds. Taste and smell are primary senses for adults when eating, but it looks as if Jonathan has already had his fill of those.

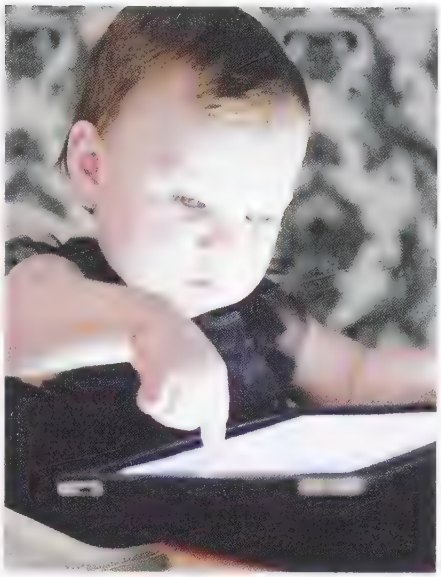
Toddlers delight in squeezing all the toothpaste out of the tube, drawing on the wall, or uncovering an anthill—activities they have never seen an adult do. Piaget referred to the stage-five toddler as a "**little scientist**" who "experiments in order to see." Their research method is trial and error. Their devotion to discovery is familiar to every adult scientist—and to every parent. Protection needed.

Finally, in the sixth stage (ages 18 to 24 months), toddlers use *mental combinations*, intellectual experimentation via imagination that can supersede the active experimentation of stage five. Because they combine ideas, stage-six toddlers think

about consequences, hesitating a moment before yanking the cat's tail or dropping a raw egg on the floor.

Thus, the stage-six sequence may begin with thought followed by action. Of course, the urge to explore may overtake caution: Things that are truly dangerous (cleaning fluids, swimming pools, open windows) need to be locked and gated.

The ability to combine ideas allows stage six toddlers to pretend. For instance, they know that a doll is not a real baby, but they can belt it into a stroller and take it for a walk. At 22 months, my grandson gave me imaginary "shoe ice cream" and laughed when I pretended to eat it.



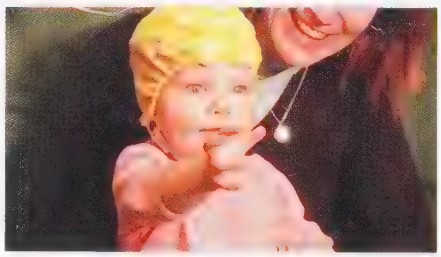
Push Another Button Little scientists "experiment in order to see" as this 14-month-old does. Many parents realize, to their distress, that their infant has deleted a crucial file, or called a distant relative on a cell phone, because the toddler wants to see what happens

Piaget describes another stage-six intellectual accomplishment involving both thinking and memory. **Deferred imitation** occurs when infants copy behavior they noticed hours or even days earlier (Piaget, 1962/2013). Piaget described his daughter, Jacqueline, who observed another child

> who got into a terrible temper. He screamed as he tried to get out of a playpen and pushed it backward, stamping his feet. Jacqueline stood watching him in amazement, never having witnessed such a scene before. The next day, she herself screamed in her playpen and tried to move it, stamping her foot lightly several times in succession.
>
> (*Piaget, 1962, p. 63*)

deferred imitation A sequence in which an infant first perceives something done by someone else and then performs the same action hours or even days later

LaunchPad



Video: Event-Related Potential (ERP) Research shows a procedure in which the electrical activity of an infant's brain is recorded to see if the brain responds differently to familiar versus unfamiliar words.

a view from science

Piaget and Modern Research

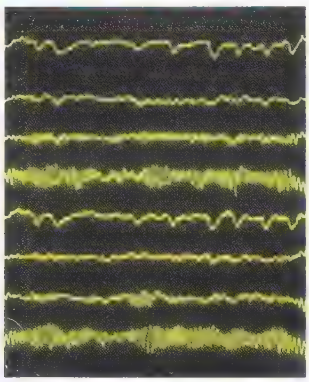
As detailed by hundreds of developmentalists, many infants reach the stages of sensorimotor intelligence earlier than Piaget predicted (Oakes et al., 2011). Not only do 5-month-olds show surprise when objects seem to disappear (evidence of object permanence before 8 months) but babies younger than 1 year pretend and defer imitation (both stage-six abilities, according to Piaget) (Teiser et al., 2014; Slater, 2012; Meltzoff & Moore, 1999). How could a gifted scientist be so wrong? There are at least three reasons.

First, Piaget's original insights were based on his own infants. Direct observation of three children is a start, and Piaget was an extraordinarily meticulous and creative observer, but no contemporary researcher would stop there. Given the immaturity and variability of babies, dozens of infants must be studied.

For instance, as evidence for early object permanence, Renée Baillargeon (2000) listed 30 studies involving more than a thousand infants younger than 6 months old. She and her collaborators continued to study object permanence with hundreds of infants, learning when and in what circumstances babies understand the concept, based not on one infant but on many infants of various backgrounds (e.g., Baillargeon et al., 2012).

Second, infants are not easy to study; there are problems with "fidelity and credibility" (Bornstein et al., 2005, p. 287). To overcome these problems, modern researchers use innovative statistics, research designs, sample sizes, and strategies that were not available to Piaget. As a result, contemporary scientists often find that object permanence, deferred imitation, and other sensorimotor accomplishments occur earlier, and with more variation, than

TABLE 6.2 Some Techniques Used by Neuroscientists to Understand Brain Function



EEG, normal brain

Technique

EEG (electroencephalogram)

Use

Measures electrical activity in the top layers of the brain, where the cortex is

Limitations

Especially in infancy, much brain activity of interest occurs below the cortex.



ERP when listening

Technique

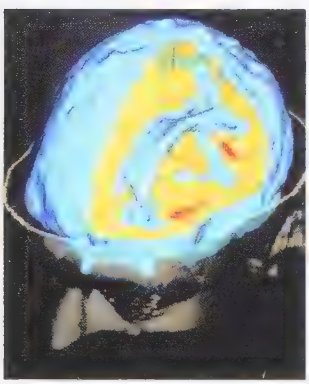
ERP (event-related potential)

Use

Notes the amplitude and frequency of electrical activity (as shown by brain waves) in specific parts of the cortex in reaction to various stimuli.

Limitations

Reaction within the cortex signifies perception, but interpretation of the amplitude and timing of brain waves is not straightforward



fMRI when talking

Technique

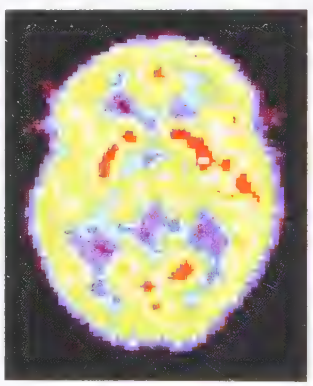
fMRI (functional magnetic resonance imaging)

Use

Measures changes in blood flow anywhere in the brain (not just the outer layers)

Limitations

Signifies brain activity, but infants are notoriously active, which can make fMRIs useless.



PET scan of sleep

Technique

PET (positron emission tomography)

Use

PET (like fMRI) reveals activity in various parts of the brain. Locations can be pinpointed with precision, but PET requires injection of radioactive dye to light up the active parts of the brain

Limitations

Many parents and researchers hesitate to inject radioactive dye into an infant's brain unless a serious abnormality is suspected.



fNIRS of a college student

Technique

fNIRS (functional near-infrared spectroscopy)

Use

Via light waves that indicate blood flow, the fNIRS measures activity in the cortex and beyond. The device is portable and non-invasive: no need for expensive equipment, electrodes, or special dye. This is especially useful for infants who do not stay still or for sports players who might have concussions

Limitations

Does not show activity deep in the brain, so the amygdala and hippocampus, among other crucial areas, cannot be measured

For both practical and ethical reasons, it is difficult to use these techniques on large, representative samples. One of the challenges of neuroscience is to develop methods that are harmless, quick, acceptable to parents and babies, and comprehensive. A more immediate challenge is to depict the data in ways that are easy to interpret and understand

More to Come Hundreds of neuroscientists are developing new ways to perceive and analyze infant brain activity, as part of a $300 million dollar investment President Obama announced in 2014 as part of BRAIN (**B**rain **R**esearch through **A**dvancing **I**nnovative **N**eurotechnologies)



Piaget had assumed (Carey, 2009). For instance, if an infant looks a few milliseconds longer when an object seems to have vanished, is that evidence of object permanence? Many researchers believe the answer is yes—but only advanced cameras, programmed by computers, can measure it.

One particular research strategy has been a boon to scientists, confirming the powerful curiosity of very young babies. That research method is called **habituation** (from the word *habit*). Habituation refers to getting accustomed to an experience after repeated exposure, as when the school cafeteria serves macaroni day after day or when infants repeatedly encounter the same sound, sight, toy, or so on. Evidence of habituation is loss of interest (or, for macaroni, loss of appetite).

Using habituation as a research strategy with infants involves repeating one stimulus until babies lose interest and then presenting another, slightly different stimulus (a new sound, sight, or other sensation). Babies indicate that they detect a difference between the two stimuli with a longer or more focused gaze; a faster or slower heart rate; more or less muscle tension around the lips; a change in the rate, rhythm, or pressure of suction on a nipple. Such subtle indicators are recorded by technology that was unavailable to Piaget (such as eye-gaze cameras and heart monitors).

By inducing habituation and then presenting a new stimulus, scientists have learned that even 1-month-olds can detect the difference between a *pah* sound and a *bah* sound, between a circle with two dots inside it and a circle without any dots, and much more. Babies younger than 6 months perceive far more than Piaget imagined, in part because he depended on observable actions (removing that cloth), not subtle signs.

Third, several ways of measuring brain activity now allow scientists to record infant cognition before even subtle observable evidence is found (see Table 6.2) (Johnson, 2011). In **fMRI** (functional magnetic resonance imaging), a burst of electrical activity measured by blood flow within the brain is recorded, indicating that neurons are firing. This leads researchers to conclude that a particular stimulus has been noticed and processed. Scientists now know exactly which parts of the brain signify what sensations or thoughts, so electrical activity in the face area, for instance, means that the infants is processing a face. The current push to map the brain will make such discoveries more precise, allowing us to understand when the infant sees one face as rewarding and another as merely interesting.

Conclusions about early cognition are not accepted by every scientist, in part because brain imagery of normal infants is difficult and expensive. Brain scans may provide crucial information if an infant is seriously ill or injured, but many parents refuse to allow such measures on healthy infants. Further, infants fuss or move when neurological tests are underway, and hundreds of scans are needed for accurate conclusions. All this slows down neurological confirmation of infant cognition.

Nonetheless, as detailed in Chapter 5, early brain growth is rapid and wide-ranging: Dendrites proliferate, and pruning is extensive. The first months and years of life are filled with mental activity, prime time for cognitive development, as neurological research attests. Brain scans can document cognitive advances in ways that Piaget never imagined.

For instance, one experiment found that when infants hear speech, their brains begin to react more notably (registered on ERPs, or event-related potentials) at the same time that their gaze tends to focus on the mouth more than the eyes (Kushnerenko et al., 2013). The experimenters suggested that, in the last half of the first year, brain maturation more than chronological age is crucial for language development.

habituation The process of becoming accustomed to an object or event through repeated exposure to it, and thus becoming less interested in it.

fMRI Functional magnetic resonance imaging, a measuring technique in which the brain's electrical excitement indicates activation anywhere in the brain; fMRI helps researchers locate neurological responses to stimuli.

Despite several valid criticisms of Piaget's work, he was correct in many ways. Infancy is a time for several distinct advances in cognition, and each new stage described by Piaget coincides with significant new connections in brain networks and functions. Piaget was right to describe babies as avid and active learners who "learn so fast and so well" (Xu & Kushnir, 2013, p. 28). His main mistake was underestimating how rapidly their learning occurs.

Response for Parents (from page 176): It is easier and safer to babyproof the house because toddlers, being "little scientists," want to explore. However, it is important for both parents to encourage and guide the baby. If having untouchable items prevents a major conflict between the adults, that might be the best choice.

SUMMING UP Piaget discovered, studied, and then celebrated active infant learning, which he described in six stages of sensorimotor intelligence. Babies use senses and motor skills to understand their world, first with reflexes and then by adapting through assimilation and accommodation. Piaget's detailed descriptions contrasted with earlier assumptions that babies did not think until they could talk. Thousands of researchers followed his lead, using advanced technology to demonstrate cognitive development of the early months.

We now know that object permanence, pursuit of goals, and deferred imitation all develop before the ages that Piaget assigned to his stages. The infant is a "little scientist" not only at 1 year, as Piaget described, but months earlier. Thinking develops before infants have the motor skills to demonstrate their thoughts; eye movements and brain scans find that babies have active minds. Nonetheless, the avid curiosity of the toddler, with the ability to imagine, pretend, and remember, is as notable and impressive today as it was for Piaget with his own children almost a century ago.

WHAT HAVE YOU LEARNED?

1. Why did Piaget call his first stage of cognition sensorimotor intelligence?
2. How do the first two sensorimotor stages illustrate primary circular reactions?
3. What is one example of how a stage-three infant might make interesting events last?
4. How is object permanence an example of stage four of sensorimotor intelligence?
5. In sensorimotor intelligence, what is the difference between stages five and six?
6. What is now known about the sequence of object permanence, from before 6 months to after 2 years?

Information Processing

As explained in Chapter 2, Piaget's sweeping overview of four periods of cognition contrasts with **information-processing theory,** a perspective analogous to computer functioning, including input, memory, programs, analysis, and output. Just as input connects with a program and then leads to output on a computer, sensation leads to perception, which may produce cognition. Those links are described and traced in detail by information-processing theorists.

information-processing theory A perspective that compares human thinking processes, by analogy, to the computer analysis of data, including sensation, brain connections, stored memories, and output.

For infants, output might be moving a hand to uncover a toy (object permanence), saying a word to signify recognition (e.g., *mama*), or looking at one photo longer than another (habituation). Some recent studies examine changes in brain waves when infants see a picture (Kouider et al., 2013); such research both confirms and refutes Piaget's theory.

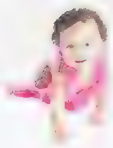


What Next? Information-processing research asks what these babies are thinking as they both pull on the same block. Will those thoughts lead to hitting, crying, or sharing?

To understand the many aspects of information processing in infancy, consider the baby's reaction to an empty stomach. A newborn simply cries as a reflex to hunger pangs, but an older hungry infant hears Mother's voice, looks for her, reaches to be picked up, and then nuzzles at her breast. Or, at an even older age, the toddler signs or says something to indicate hunger.

Each step of this process requires information to be processed. Older infants are more thoughtful and effective because of advanced information processing. Advances occur weekly or even day-by-day in the first year, with no sudden leaps, contrary to Piaget's notion of six discrete stages (Cohen & Cashon, 2006).

The information-processing perspective, aided by modern technology, has uncovered many aspects of infant cognition. As one researcher summarizes, "Rather than bumbling babies, they are individuals who . . . can learn surprisingly fast about the patterns of nature" (Keil, 2011, p. 1023). Concepts and categories seem to develop in infants' brains by 6 months or earlier (Mandler & DeLoach, 2012).



This perspective helps tie together many aspects of infant cognition. In earlier decades, infant intelligence was measured via age of sitting up, grasping, and so on, but we now know that age of achieving motor skills does not predict later intellectual achievement, although when an infant is way behind schedule (e.g., not sitting up at 8 months) that may indicate cognitive delay.

However, information-processing research has found perceptual measures that do predict later intelligence. For example, early attention and relatively rapid habituation correlate with later cognitive ability. Babies who focus intently on new stimuli, and then quickly become bored, may be more intelligent than babies who stare aimlessly (Bornstein & Colombo, 2012). Rapid habituation is an encouraging sign; smart babies like novelty.

Now let us look at two specific aspects of infant cognition that illustrate the information-processing approach: affordances and memory. Affordances concern perception or, by analogy, input. Memory concerns brain organization and output—that is, storage and retrieval.

Especially for Computer Experts In what way is the human mind *not* like a computer? (see response, page 183)

Affordances

Perception, remember, is the processing of information that arrives at the brain from the sense organs. Decades of thought and research led Eleanor and James Gibson to conclude that perception is far from automatic (E. J. Gibson, 1969; J. J. Gibson, 1979). Perception—for infants, as for the rest of us—is a cognitive accomplishment that requires selectivity: "Perceiving is active, a process of obtaining information about the world. . . . We don't simply see, we look" (E. J. Gibson, 1988, p. 5). Or, as one neuroscientist said, "You see what you expect or are trained to see, not what is there" (Freeman, quoted in Bower, 2007, p. 106).

The environment (people, places, and objects) *affords*, or offers, many opportunities to interact with whatever is perceived (E. J. Gibson, 1997). Each of these opportunities is called an **affordance.** Which particular affordance is perceived and acted on depends on four factors: sensory awareness, immediate motivation, current level of development, and past experience.

affordance An opportunity for perception and interaction that is offered by a person, place, or object in the environment.

As an example, imagine that you are lost in an unfamiliar city. You need to ask directions. Of whom? Not the first person you see. You want someone knowledgeable and approachable. Affordance is what you seek, and you scan the facial expression, body language, gender, dress, etc. of passersby (Miles, 2009). They, in turn, assess the affordance of your request. Are you genuinely lost, and do they know how to direct you? If they judge that your request is a scam, or they decide that your question is beyond them, their judgment of the affordance will force you to find another person.

Developmentalists studying children emphasize that age of the perceiver affects what affordances are perceived. For example, since toddlers enjoy running as soon as their legs allow it, every open space affords running: a meadow, a building's long hall, a highway. To adults, affordance of running is much more limited: They worry about a bull grazing in the meadow, neighbors behind the hallway doors, or traffic on the road. Furthermore, because motivation is pivotal in affordances, toddlers move when most adults prefer to stay put.

Selective perception of affordances depends not only on age, motivation, and context but also on culture. Just as a baby might be oblivious to something adults consider crucial—or vice versa—an American in, say, Cambodia might miss an important sign of the social network. In every nation, foreigners behave in ways considered rude, but their behavior may simply indicate different affordances from those of the natives.

Variation in affordance is also apparent within cultures. City-dwellers complain that visitors from rural areas walk too slowly, yet visitors complain that urbanites



MARK RICHARDS, PHOTOEDIT

Depth Perception This toddler in a laboratory in Berkeley, California, is crawling on the experimental apparatus called a visual cliff. She stops at the edge of what she perceives as a drop-off.

are always in a hurry. Sidewalks afford either fast travel or views of architecture, depending on the perceiver.

Research on Early Affordances

Experience affects which affordances are perceived. This is obvious in studies of depth perception. Research demonstrating this began with an apparatus called the **visual cliff,** designed to provide the illusion of a sudden drop-off between one horizontal surface and another (see photo). In a classic research study, 6-month-olds, urged forward by their mothers, wiggled toward Mom over the supposed edge of the cliff, but 10-month-olds, even with Mother's encouragement, fearfully refused to budge (E. J. Gibson & Walk, 1960).

Scientists once thought that a visual deficit—specifically, inadequate depth perception—prevented 6-month-olds from seeing the drop, which was why they moved forward. According to this hypothesis, as the visual cortex matured, 10-month-olds perceived that crawling over a cliff afforded falling.

Later research (using advanced technology) disproved that interpretation. Some 3-month-olds notice the drop: Their heart rate slows and their eyes open wide when they are placed over the cliff. Depth perception is in place, but until they can crawl, they do not realize that crawling over an edge affords falling.

Reaction to the visual-cliff hazard depends not only on vision but also on experience with crawling and on other specifics, such as the particular texture and depth of the supposed cliff. The difference is in *processing*, not input—in affordance, not sensory ability. Those conclusions were drawn by Eleanor Gibson herself, the scientist who did the early visual-cliff research and who explained the concept of affordance (Adolph & Kretch, 2012). Further research on the visual cliff includes the social context, with the tone of the mother's encouragement indicating whether or not the cliff affords crawling (Kim et al., 2010).

visual cliff An experimental apparatus that gives the illusion of a sudden drop-off between one horizontal surface and another.

A similar sequence happens with fear of many objects. By 9 months, infants attend to snakes and spiders more readily than to other similar images, but they do not yet fear them. A few months later, perhaps because they have learned from others, they are afraid of such creatures. Thus, perception is a prerequisite, but it does not always lead to affordance (LoBue, 2013).

Especially for Parents of Infants When should you be particularly worried that your baby will fall off the bed or down the stairs? (see response, page 184)

Movement and People

Despite the variations from one infant to another in the particular affordances they perceive, all babies are attracted to two kinds of affordances. Babies pay close attention to things that move and to people.

Dynamic perception focuses on movement. Infants love motion. As soon as they can, they move their bodies—grabbing, scooting, crawling, and walking. To their delight, such motion changes what the world affords, an early example of dynamic perception. As a result, infants strive to master the next motor accomplishment, and repeat whatever ability they already have (Adolph et al., 2012). They love to watch things that move—passing cars, flickering images on a screen, mobiles.

dynamic perception Perception that is primed to focus on movement and change.

It's almost impossible to teach a baby not to chase and grab any moving creature, including a dog, a cat, or even a cockroach. Infants' interest in motion was the inspiration for another experiment that sought to learn what affordances were perceived by babies too young to talk or walk (van Hof et al., 2008). A ball was moved at various speeds in front of infants aged 3 to 9 months. Most tried to touch or catch the ball as it passed within reach. However, marked differences appeared in their perception of the affordance of "catchableness."

Sometimes younger infants did not reach for slow-moving balls yet tried to grasp the faster balls. They tried but failed, touching the ball only about 20 percent of the time. By contrast, the 9-month-olds knew when a ball afforded catching. They

grabbed the slower balls and did not try to catch the fastest ones; their success rate was almost 100 percent. This "follows directly from one of the key concepts of ecological psychology, that animals perceive the environment in terms of action possibilities or affordances" (van Hof et al., 2008, p. 193).

Another universal principle of infant perception is **people preference.** This follows from evolutionary psychology: Over the millennia, humans survived by learning to attend to, and rely on, one another. You just read that the affordance of the visual cliff depends partly on the tone of the mother's voice. Infants soon recognize their caregivers and expect certain affordances (comfort, food, entertainment) from them.

people preference A universal principle of infant perception, specifically an innate attraction to other humans, evident in visual, auditory, and other preferences.

Very young babies are particularly interested in emotional affordances, using their limited perceptual abilities and intellectual understanding to respond to smiles, shouts, and so on. Indeed, in one study, babies watched a three-second video demonstration by an actor whose face was covered (so no visual expression could be seen) as he acted out happiness, anger, or indifference. The results: 6-month-olds can distinguish whether a person is happy or angry by body moments alone (Zieber et al., 2014). Hundreds of experiments have shown that infants are able to connect movements, facial expressions, and tone of voice long before they understand language. This ability led to an interesting hypothesis:

> Given that infants are frequently exposed to their caregivers' emotional displays and further presented with opportunities to view the affordances (Gibson, 1959, 1979) of those emotional expressions, we propose that the expressions of familiar persons are meaningful to infants very early in life.
>
> *[Kahana-Kalman & Walker-Andrews, 2001, p. 366]*

Building on earlier research design, these researchers tested their hypothesis by presenting infants with two moving images side by side on one video screen (Kahana-Kalman & Walker-Andrews, 2001). Both images were of the same woman, either the infant's own mother or a stranger. In one image, the woman was joyful; in the other, sad. Each presentation was accompanied by an audiotape of that woman's happy *or* sad talk.

Previous studies had found that 7-month-olds could match emotional words with facial expressions, but younger babies could not. In that research, at 7 months, but not earlier, infants looked longer at strangers whose voice matched the emotion on their face and less long at strangers whose face did not match the tone.

These researchers first replicated the earlier experiments, again finding that 3½-month-old babies could not match a stranger's voice and facial expression. Then the 3½-month-olds saw two images of their *own* mother and heard her happy or her sad voice. They correctly matched visual and vocal emotions. They looked longest when their smiling mother talked happily; but, when their mother sounded sad, they stared more at the video of their sad-faced mother than at the video of their happy mother—thus connecting sound and sight, presumably based on their past experience with that person.

The researchers noticed something else as well. When infants saw and heard their happy mothers, they smiled twice as fast, seven times as long, and much more brightly (cheeks raised and lips upturned) than for the happy strangers. Experience had taught them that a smiling mother affords joy. The affordances of a smiling stranger are more difficult to judge.



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Grab Him As with most babies, she loves grabbing any creature, hoping for a reaction. To recognize that people change over time, imagine these two a few years or decades older. She would not grab him, and if she did, he would not be placid.

Response for Computer Experts (from page 181): In dozens of ways, including speed of calculation, ability to network across the world, and vulnerability to viruses. In at least one crucial way, the human mind is better: Computers become obsolete or fail within a few years, while human minds keep advancing for decades.

Memory

Information-processing research, with detailed behavioral and neurological measures, finds that memory is evident in very young babies. Within the first weeks after birth, infants recognize their caregivers by face, voice, and smell. Memory

Response for Parents of Infants (from page 182): Constant vigilance is necessary for the first few years of a child's life, but the most dangerous age is from about 4 to 8 months, when infants can move but do not yet fear falling over an edge.

improves month by month. In one study, after 6-month-olds had had only two half-hour sessions with a novel puppet, a month later they remembered the experience—an amazing feat of memory for babies who could not talk or even stand up (Giles & Rovee-Collier, 2011).

There are several distinct types of memories, each in a particular part of the brain that is developing in its own way. That means that, even though infants already remember some things, other kinds of memory build and emerge throughout childhood. Instead of noting the many "faults and shortcomings relative to an adult standard," it may be more appropriate to realize that children of all ages remember what they need to remember (Bjorklund & Sellers, 2014, p. 142). Sensory and caregiver memories are apparent in the first month, motor memories by 3 months, and then, at about 9 months, more complex memories (Mullally & Maguire, 2014).

Forget About Infant Amnesia

The evidence suggests that *infant amnesia*, which is the belief that infants remember nothing, is mistaken. It is true that adults rarely remember events that occurred before they were 3. Children do somewhat better, remembering what happened at age 2. But the fact that memories fade with time does not mean that memory is absent.

If you forgot your third grade teacher's name, for example, that does not mean that you had no memory when you were 9; it just means that you do not now remember what you could easily remember many years ago. And memory itself may be inaccessible, but not completely gone. If you saw a photo of your third grade teacher, and a list of four possible names for her or him, you probably could choose correctly.

No doubt memory is fragile in the first months of life and improves with age over the first months and years. Apparently a certain amount of experience and a certain amount of brain maturation are required in order to process and recall what happens (Bauer et al., 2010). But some of that experience happens on day one—or even in the womb—and some memories may begin long before a baby can say them.

LaunchPad

Video: Contingency Learning in Young Infants shows Carolyn Rovee-Collier's procedure for studying instrumental learning in young infants.



Selective Amnesia As we grow older, we forget about spitting up, nursing, crying, and almost everything else from our early years. However, strong emotions (love, fear, mistrust) may leave lifelong traces.

One reason for the apparent fragility is linguistic: People use words to store (and sometimes distort) memories, so preverbal children have difficulty with recall (Richardson & Hayne, 2007), while adults cannot access their infant memories because they did not yet have words to solidify them. Another probable reason is that memories fade over time: Adults cannot remember what happened when they were 1, but 2-year-olds can, because the memory traces in the brain have not yet been degraded (Mullally & Maguire 2014).

Conditions of Memory

Many studies seek to understand what infants *can* remember, even if they cannot later put memories into words. Memories are particularly evident if:

- Motivation and emotion are high.
- Retrieval is strengthened by reminders and repetition.

The most dramatic proof of infant memory comes from innovative experiments in which 3-month-olds learned to move a mobile by kicking their legs (Rovee-Collier, 1987, 1990). The infants lay on their backs connected to a mobile by means of a ribbon tied to one foot (see photo). Virtually every baby began making occasional kicks (as well as random arm movements and noises) and realized that kicking made the mobile move. They then kicked more vigorously and frequently, sometimes laughing at their accomplishment. So far, this is no surprise—observing self-activated movement is highly reinforcing to infants, a dynamic perception.

When some infants had the mobile-and-ribbon apparatus reinstalled and reconnected *one week later,* most started to kick immediately. Their reaction indicated that they remembered their previous experience. But when other 3-month-old infants were retested *two weeks later,* they began with only random kicks. Apparently they had forgotten what they had learned—evidence that memory is fragile early in life. But that conclusion needs revision, or at least qualification.



TEK IMAGE/SCIENCE SOURCE

He Remembers! In Rovee-Collier's experiment, a young infant immediately remembers how to make the familiar mobile move. (Unfamiliar mobiles do not provoke the same reaction.) He kicks his right leg and flails both arms, just as he learned to do several weeks ago.

Reminders and Repetition

The lead researcher in the mobile experiments, Carolyn Rovee-Collier, developed another experiment demonstrating that 3-month-old infants *could* remember after two weeks *if* they had a brief reminder session before being retested (Rovee-Collier & Hayne, 1987). A **reminder session** is any experience that helps people recollect an idea, a thing, or an event.

reminder session A perceptual experience that helps a person recollect an idea, a thing, or an experience.

In this particular reminder session, *two weeks* after the initial training, the infants watched the mobile move but were *not* tied to it and were positioned so that they could *not* kick. The next day, when they were again connected to the mobile and positioned so that they could move their legs, they kicked as they had learned to do two weeks earlier.

Apparently, watching the mobile move on the previous day had revived their faded memory. The information about making the mobile move was stored in their brains, but they needed processing time to retrieve it. The reminder session provided that time. Other research similarly finds that repeated reminders are more powerful than single reminders and that context is crucial, especially for infants younger than 9 months old: Being tested in the same room as the initial experience aids memory (Rovee-Collier & Cuevas, 2009).

Who Is Thinking? They all are. Julie is stretching her sensorimotor intelligence as she rotates a piece to make it fit, while her mother notices that her 2-year-old is ready for a puzzle with 20 cardboard pieces. But the champion thinker may be baby Samara; babies learn a lot by watching.

A Little Older, a Little More Memory

After about 6 months of age, infants retain information for a longer time than younger babies do, with less training or reminding. Many researchers find that by 9 months, memory markedly improves, although it is not clear if this is purely maturational or if it is the result of locomotion, since 9-month-olds can usually crawl (Mullally & Maguire, 2014).

Memory researchers now believe that several kinds of memory, lodged in various parts of the brain, reach an important level of maturation at about 9 months. For example, linguistic memory is evident when a baby's vocalizations begin to sound like the speech he or she has heard. Motor memory is evident when an infant first watches someone else play with a new toy and, the next day, plays with it in the same way as he or she had observed. Infants younger than 9 months do not usually do this.



ITY IMAGES

Many experiments show that 1-year-olds can transfer learning from one object or experience to another. They learn from various people and events—from parents and strangers, from other babies and older siblings, from picture books and family photographs (Hayne & Simcock, 2009).

The dendrites and neurons of the brain change to reflect remembered experiences during infancy. (**Developmental Link:** Experience-related brain growth is described in Chapter 5.) Note that these experiments are further evidence of several facts already mentioned: Babies observe affordances carefully, and they are especially attuned to movement, people, and emotions.

The crucial insight from information processing is that the brain is a very active organ, changing with each day's events. Therefore, the particulars of early experiences and memory are critically important in determining what a child knows or does not know.

Generalization becomes possible. At every age "people perceive more of a visual scene than was presented to them." Even infants develop expectancies for what they observe and fill in the unseen parts (Mullally & Maguire, 2014).

Many studies show that infants remember not only specific events and objects but also patterns and general goals (Keil, 2011). Some examples come from research, such as memory of what syllables and rhythms are heard and how objects move in relation to other objects. Additional examples arise from close observations of babies at home, such as what they expect from a parent or a babysitter, or what details indicate bedtime. Every day of their young lives, infants are processing information and storing conclusions.

Especially for Teachers People of every age remember best when they are active learners. If you had to teach fractions to a class of 8-year-olds, how would you do it? (see response, page 188)

SUMMING UP Information processing analyzes each component of how thoughts begin: how they are organized, remembered, and expressed, and how cognition builds, day by day. Infants' perception is powerfully influenced by particular experiences and motivation; affordances perceived by one infant differ from those perceived by another. Memory depends on brain maturation and on experience. For that reason, memory is fragile in the first year (though it can be triggered by reminders) and becomes more robust, although still somewhat fragile, in the second year. In both perception and memory, babies are similar to adults in many ways—infant amnesia is a myth. On the other hand, information-processing research confirms that experience and maturation both advance cognition: Infants do not process information as well as older children or adults do.

WHAT HAVE YOU LEARNED?

1. How do the affordances of this book, for instance, differ for someone at 1 month, 12 months, and 20 years of age?
2. What are several hypotheses to explain why infants refuse to crawl over visual cliffs?
3. What two preferences show that infants are selective in early perception?
4. What conditions help 3-month-olds remember something?
5. How is infant memory similar to, and unlike, adult memory?

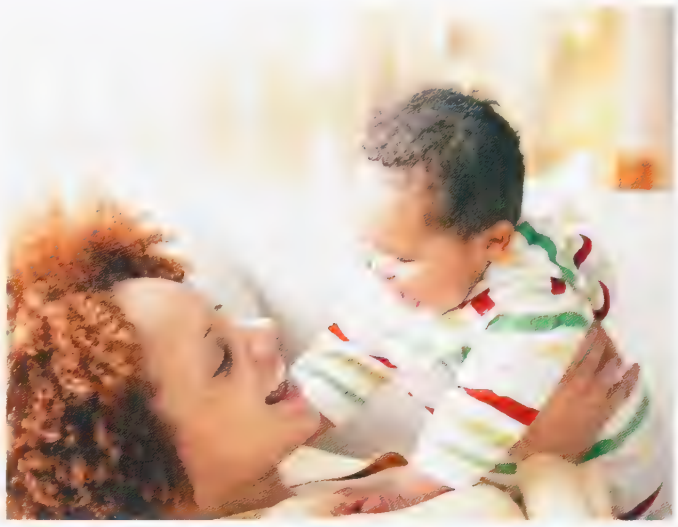
Language: What Develops in the First Two Years?

The brains of other species have nothing like the neurons and networks that support the 6,000 or so human languages. Many other animals communicate, but their language is primitive. The human linguistic ability at age 2 far surpasses that of full-grown adults from every other species. How do babies do it? Part of the

answer is that learning language is a priority; babies listen intensely, figuring out speech. One scholar explains "infants are acquiring much of their native language before they utter their first word" (Aslin, 2012, p. 191).

The Universal Sequence

The sequence of language development is the same worldwide (see At About This Time). Some children learn several languages, some only one; some learn rapidly and others slowly, but they all follow the same path. Even deaf infants who become able to hear (thanks to cochlear implants) follow the sequence, catching up to their age-mates unless they have multiple disabilities (Fazzi et al., 2011). Those who learn sign language also begin with one word at a time, and then sign sentences of increasing length and complexity.



Who Is Babbling? Probably both the 6-month-old and the 27-year-old are. During every day of infancy, mothers and babies communicate with noises, movements (notice the hands), and expressions

Listening and Responding

Newborns prefer to listen to the language their mother spoke when they were in the womb, not because they understand the words, of course, but because they are familiar with the rhythm, the sounds, and the cadence.

Surprisingly, newborns of bilingual mothers differentiate between both languages (Byers-Heinlein et al., 2010). Data were collected on 94 newborns (age 0 to 5 days) in a large hospital in Vancouver, Canada. Half were born to mothers who spoke both English and Tagalog (a native language of the Philippines), one-third to mothers who spoke only English, and one-sixth to mothers who spoke English

at about this time

The Development of Language in the First Two Years

Age*	Means of Communication
Newborn	Reflexive communication—cries, movements, facial expressions.
2 months	A range of meaningful noises—cooing, fussing, crying, laughing.
3–6 months	New sounds, including squeals, growls, croons, trills, vowel sounds.
6–10 months	Babbling, including both consonant and vowel sounds repeated in syllables.
10–12 months	Comprehension of simple words; speech-like intonations; specific vocalizations that have meaning to those who know the infant well. Deaf babies express their first signs; hearing babies also use specific gestures (e.g., pointing) to communicate.
12 months	First spoken words that are recognizably part of the native language.
13–18 months	Slow growth of vocabulary, up to about 50 words.
18 months	Naming explosion—three or more words learned per day. Much variation.
21 months	First two-word sentence.
24 months	Multiword sentences. Half the toddler's utterances are two or more words long.

*The ages in this table reflect norms. Many healthy, intelligent children attain each linguistic accomplishment earlier or later than indicated here.

Response for Teachers (from page 186) Remember the three principles of infant memory: recency, motivation, and repetition. Find something children already enjoy that involves fractions—even if they don't realize it. Perhaps get a pizza and ask them to divide it into halves, quarters, eighths, sixteenths, and so on.

and Chinese. The bilingual mothers used English in more formal contexts and non-English with family.

The infants in all three groups sucked on a pacifier connected to a recording of 10 minutes of English or Tagalog matched for pitch, duration, and number of syllables. As evident in the frequency and strength of their sucking, most of the infants with bilingual mothers preferred Tagalog, presumably because their mothers were likely to speak English in formal settings but Tagalog when with family and friends, whereas those with monolingual mothers preferred English.

The Chinese bilingual babies (who had never heard Tagalog) nonetheless preferred it. The researchers believe that they liked Tagalog because the rhythm of that language is more similar to Chinese than to English (Byers-Heinlein et al., 2010).

Similar results, showing that babies like to hear familiar language, come from everyday life. Young infants attend to voices more than to mechanical sounds (a clock ticking) and look closely at the facial expressions of someone talking to them (Minagawa-Kawai et al., 2011). By 6 months, by observing mouth movements alone (no sound), they can decipher whether or not that person is speaking their native language (Weikum et al., 2007). By 1 year, they are more likely to imitate the actions of a stranger speaking their native language than those of a person who speaks another language (Buttelmann et al., 2013).

child-directed speech The high-pitched, simplified, and repetitive way adults speak to infants and children. (Also called *baby talk* or *motherese*.)

babbling An infant's repetition of certain syllables, such as *da-da-da* or *ba-ba-ba*, beginning when babies are about 6 to 9 months old.

Infants' ability to distinguish sounds they hear improves, whereas the ability to hear sounds never spoken in their native language (such as how an "r" or an "l" is pronounced) deteriorates (Narayan et al., 2010). If parents want a child to be fluent in two languages, they should speak both of them to their baby.

In every language, adults use higher pitch, simple words, repetition, varied speed, and exaggerated emotional tone when talking to infants (Bryant & Barrett, 2007). This special language form is sometimes called *baby talk*, since it is directed to babies, and sometimes called *motherese*, since mothers universally speak it. Nonmothers speak it as well. For that reason, scientists prefer the more formal term, **child-directed speech.**

Especially for Nurses and Pediatricians The parents of a 6-month-old have just been told that their child is deaf. They don't believe it because, as they tell you, the baby babbles as much as their other children did. What do you tell them? (see response, page 190)

No matter what term is used, child-directed speech fosters learning, and babies communicate as best they can. By 4 months, they squeal, growl, gurgle, grunt, croon, and yell, telling everyone what is on their minds in response to both their own internal state and their caregivers' words. At 7 months, infants begin to recognize words that are highly distinctive (Singh, 2008): *Bottle*, *dog*, and *mama*, for instance, might be differentiated, but words that sound alike (*baby*, *Bobbie*, and *Barbie*) are not.

Not only do infants prefer child-directed speech; they also like alliteration, rhymes, repetition, melody, rhythm, and varied pitch (Hayes & Slater, 2008; Schon et al., 2008). Think of your favorite lullaby (itself an alliterative word); obviously, babies prefer sounds over content.



Are You Hungry? Pronunciation is far more difficult than hand skills, but parents want to know when their baby wants more to eat. One solution is evident here. This mother is teaching her 12-month-old daughter the sign for "more," a word most toddlers say several months later.

Babbling and Gesturing

Between 6 and 9 months, babies repeat certain syllables (*da-da-da*, *ba-ba-ba*), a vocalization called **babbling** because of the way it sounds. Babbling is experience-expectant: all babies babble, even deaf ones. Since babies like to make interesting sights last, as Piaget found, babbling increases in response to child-directed speech. Deaf babies stop babbling but increasingly engage in responsive gesturing.

Toward the end of the first year, babbling begins to sound like the infant's native language; infants imitate accents, cadence, consonants, and so on. Videos of deaf infants whose



parents sign to them show that 10-month-olds use about a dozen distinct hand gestures in a repetitive manner similar to babbling.

Many caregivers, recognizing the power of gestures, teach "baby signs" to their 6- to 12-month-olds, who communicate with hand signs months before they move their tongues, lips, and jaws to make specific words. There is no evidence that baby signing accelerates talking (as had been claimed), but it may make parents more responsive, which itself is an advantage (Kirk et al., 2013).

One early gesture is pointing, an advanced social gesture that requires understanding another person's perspective. Most animals cannot interpret pointing; most 10-month-old humans look toward wherever someone else points and can already use a tiny index finger (not just a full hand) to point themselves, even to a place where an object belongs but is not yet there (Liszkowski et al., 2009; Liszkowski & Tomasello, 2011). Pointing is well developed by 12 months, especially when the person who is pointing also speaks (e.g., "look at that") (Daum et al., 2013).



Show Me Where Pointing is one of the earliest forms of communication, emerging at about 10 months. As you see here, pointing is useful lifelong for humans.

Babbling and gesturing before speech vary from infant to infant—sometimes for biological reasons, sometimes for social ones. Developmentalists can detect early signs of autism, attention-deficit/hyperactivity disorder, hearing impairment, and dyslexia by examining videos of the communication patterns of young infants. However, definitive diagnosis is not possible simply by observation in the early months.

First Words

Finally, at about 1 year, the average baby utters a few words, understood by caregivers if not by strangers. For example at 13 months, a child named Kyle knew standard words such as *mama*, but he also knew *da*, *ba*, *tam*, *opma*, and *daes*, which his parents knew to be, respectively, "downstairs," "bottle," "tummy," "oatmeal," and "starfish." He also had a special sound that he used to call squirrels (Lewis et al., 1999).

Gradual Beginnings

In the first months of the second year, spoken vocabulary increases gradually (perhaps one new word a week). A 12-month-old who speaks two words might not speak eight words until several weeks later. However, meanings are learned rapidly; babies understand about 10 times more words than they can say.

Initially, the first words are merely labels for familiar things (*mama* and *dada* are common), but early words are soon accompanied by gestures, facial expressions, and nuances of tone, loudness, and cadence (Saxton, 2010). Imagine meaningful communication in "Dada," "Dada?," and "Dada!" Each is a **holophrase,** a single word that expresses an entire thought.

holophrase A single word that is used to express a complete, meaningful thought.

Intonation (variation in tone and pitch) is extensive in both babbling and holophrases, but there sometimes is a lull between the age of babbling and the age of recognizable words. Apparently at about 1 year, infants reorganize their vocalization from universal to language-specific. They are no longer just making noises; they are trying to communicate in a specific language.

Uttering meaningful words takes all their attention—none is left over for intonation. Careful tracing of early language finds other times when vocalization slows before a burst of new talking; perception affects action (Pulvermüller & Fadiga, 2010), and neurological advances may temporarily inhibit speech (Parladé & Iverson, 2011).

The Naming Explosion

naming explosion A sudden increase in an infant's vocabulary, especially in the number of nouns, that begins at about 18 months of age

Spoken vocabulary builds rapidly once the first 50 words are mastered, with 21-month-olds typically saying twice as many words as 18-month-olds (Adamson & Bakeman, 2006). This language spurt is called the **naming explosion** because many early words are nouns, that is, names of persons, places, or things.

Between 12 and 18 months, almost every infant learns the name of each significant caregiver (often *dada, mama, nana, papa, baba, tata*) and sibling (and sometimes each pet). Other frequently uttered words refer to the child's favorite foods (*nana* can mean "banana" as well as "grandma") and to elimination (*pee-pee, wee-wee, poo-poo, ka-ka, doo-doo*).

Notice that all these words have two identical syllables, each a consonant followed by a vowel. Many words follow that pattern—not just baba but also bobo, bebe, bubu, bibi. Other early words are only slightly more complicated—ma-me, ama, and so on. The meaning of these words varies by language, but every baby says such words, and everywhere culture assigns meaning to them.

Cultural Differences

Especially for Caregivers A toddler calls two people "Mama." Is this a sign of confusion? (see response, page 193)

Response for Nurses and Pediatricians (from page 188): Urge the parents to learn sign language and investigate cochlear implants. Babbling has a biological basis and begins at a specified time, in deaf as well as in hearing babies. However, deaf babies eventually begin to use gestures more and to vocalize less than hearing babies. If their infant can hear, sign language does no harm. If the child is deaf, however, lack of communication may be devastating.

Cultures and families vary in how much child-directed speech children hear. Some parents read to their infants, teach them signs, and respond to every burp or fart as if it were an attempt to talk. Other parents are much less verbal. They use gestures and touch; they say "hush" and "no" instead of expanding vocabulary.

By 5 months, babies prefer adults who often use child-directed speech, even when those talkative adults are temporarily silent. Apparently, just as infants seek to master motor skills as soon as they can, they seek to learn language from the best teachers available (Schachner & Hannon, 2011).

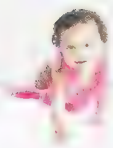
Cultural differences are readily apparent in what linguistic sounds capture attention. Infants soon favor the words, accents, and linguistic patterns of their home language. For instance, a study of preverbal Japanese and French infants found that words with the first consonant at the front of the mouth and the second consonant at the back (as in "bat") was preferred by infants in France, but the opposite (as in "tap") was true in Japan. This was the case because of the language (French or Japanese) the babies had heard (Gonzalez-Gomez et al., 2014).

The traditional idea that children should be "seen but not heard" is contrary to what developmentalists recommend and many contemporary families do—encourage talking. By contrast, many other families value children who listen respectfully without talking. Everywhere, however, infants listen to whatever speech

Universal or Culture-Specific? Both. All children enjoy music and like to bang on everything, from furniture to people. Making noise is fun, but even infants prefer the noises of their community and do their best to repeat them. This boy has learned to play the bongo drums (notice the skilled angle of his hands) thanks to his grandfather



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they hear and appreciate the sounds of their culture. Even musical tempo is culture-specific: 4- to 8-month-olds seem to like their own native music best (Soley & Hannon, 2010).

Parts of Speech

Although all new talkers say names, use similar sounds, and prefer nouns more than other parts of speech, the ratio of nouns to verbs and adjectives varies from place to place (Waxman et al., 2013). For example, by 18 months, English-speaking infants speak far more nouns than verbs compared to Chinese or Korean infants. Why?

One explanation goes back to the language itself. The Chinese and Korean languages are "verb-friendly" in that verbs are placed at the beginning or end of sentences. That facilitates learning. By contrast, English verbs occur anywhere in a sentence, and their forms change in illogical ways (e.g., *go, gone, will go, went*). This irregularity may make English verbs harder to learn, although the fact that English verbs often have distinctive suffixes (*-ing, -ed*) and helper words (*was, did, had*) may make it easier (Waxman et al., 2013).

An alternative explanation considers the entire social context: Playing with a variety of toys and learning about dozens of objects are routine in North America, whereas East Asian cultures emphasize human interactions—specifically, how one person responds to another. Accordingly, North American infants are expected to name many objects, whereas Asian infants are expected to act on objects and respond to people.

Thus, Chinese toddlers might learn the equivalent of *come, play, love, carry, run,* and so on earlier. Indeed, 14-month-olds in Chinese-speaking families learn some new words more readily than do their English-speaking peers, with the Chinese infants better able to learn action words than object labels (Chan et al., 2011).

A simpler explanation is that young children are sensitive to sounds. Verbs are learned more easily if they sound like the action (Imai et al., 2008), and such verbs are more common in some languages than others.

English does not have many onomatopoeic verbs, which makes verb-learning difficult. (*Jump, kiss,* and *poop*—all learned early on—are exceptions.) When the same word could be a noun or a verb, English-speaking mothers say them differently: *Kiss,* for instance, is spoken with more emphasis as a noun than a verb, so babies learn the noun before the verb (Conwell & Morgan, 2012). The infant's focus on sounds explains why many toddlers who have never been on a farm know that cows "moo" and ducks "quack."

Every language has some words and concepts that are difficult. English-speaking infants confuse *before* and *after;* Dutch-speaking infants misuse *out* when it refers to taking off clothes; Korean-speaking infants need to learn two meanings of *in* (Mandler, 2004). Learning adjectives is easier in Italian and Spanish than in English or French because of patterns in those languages (Waxman & Lidz, 2006). Specifically, adjectives can stand by themselves without the nouns. If I want a blue cup from a group of multicolored cups, I would ask for "a blue cup" or "a blue one" in English but simply "uno azul" (a blue) in Spanish. Despite such variations, in every language, infants rapidly acquire both vocabulary and grammar.

grammar All the methods—word order, verb forms, and so on—that languages use to communicate meaning, apart from the words themselves.

Putting Words Together

Grammar includes all the methods that languages use to communicate meaning. Word order, prefixes, suffixes, intonation, verb forms, pronouns and negations, prepositions and articles—all of these are aspects of grammar. Grammar can be discerned in holophrases, as one word can be spoken differently depending on

VISUALIZING DEVELOPMENT

Early Communication and Language Development

A COMMUNICATION MILESTONES: THE FIRST TWO YEARS

These are norms. Many intelligent and healthy babies vary in the age at which they reach these milestones.

Months	Communication Milestone
0	Reflexive communication—cries, movements, facial expressions
1	Recognizes some sounds Makes several different cries and sounds Turns toward familiar sounds
3	A range of meaningful noises—cooing, fussing, crying, laughing Social smile well established Laughter begins Imitates movements Enjoys interaction with others
6	New sounds, including squeals, growls, croons, trills, vowel sounds Meaningful gestures including showing excitement (waving arms and legs) Deaf babies express their first signs Expresses negative feelings (with face and arms) Capable of distinguishing emotion by tone of voice Responds to noises by making sounds Uses noise to express joy and unhappiness Babbles, including both consonant and vowel sounds repeated in syllables
10	Makes simple gestures, like raising arms for "pick me up" Recognizes pointing Makes a sound (not in recognizable language) to indicate a particular thing Responds to simple requests
12	More gestures, such as shaking head for "no" Babbles with inflection, intonation Names familiar people (like "mama," "dada," "nana") Uses exclamations, such as "uh-oh!" Tries to imitate words Points and responds to pointing First spoken words
18	Combines two words (like "Daddy bye-bye") Slow growth of vocabulary, up to about 50 words Language use focuses on 10–30 holophrases Uses nouns and verbs Uses movement, including running and throwing, to indicate emotion Naming explosion may begin, three or more words learned per day Much variation: Some toddlers do not yet speak
24	Combines three or four words together; half the toddler's utterances are two or more words long Uses adjectives and adverbs ("blue," "big," "gentle") Sings simple songs

SOURCE: AMERICAN ACADEMY OF PEDIATRIC

...& MILESTONES LISTED ON P. 5C-1

B UNIVERSAL FIRST WORDS

Across cultures, babies' first words are remarkably similar. The words for mother and father are recognizable in almost any language. Most children will learn to name their immediate family and caregivers between the ages of 12 and 18 months.

Language	Mother	Father
English	mama, mommy	dada, daddy
[illegible]	mama	papa
[illegible]	maman, mama	papa
[illegible]	mamma	bebbo, papa
[illegible]	mama	te-te
[illegible]	mama	babe
[illegible]	be-mama	taata
[illegible]	mama	baba
[illegible]	nana	tata
[illegible]	ema	abba
[illegible]	oma	apa

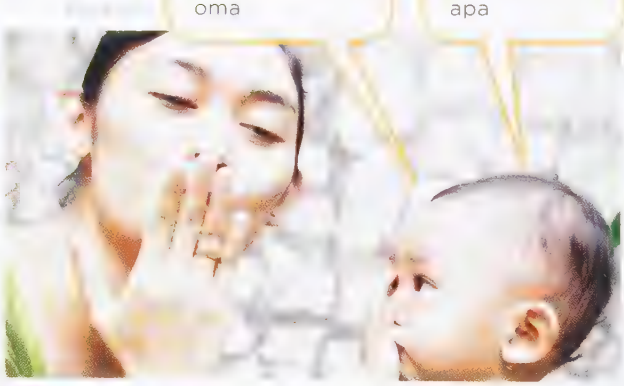


PHOTO: R. EKO BINTORO/THINKSTOCK

C MASTERING LANGUAGE (MLU)

Children's use of language becomes more complex as they acquire more words and begin to master grammar and usage. A child's spoken words or sounds (utterances) are broken down into the smallest units of language to determine their length and complexity:

SAMPLES OF UTTER[illegible]

"Doggie!" = 1

"Doggie + Sleep" = 2

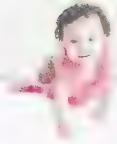
"Doggie + Sleep + ing" = 3

"Shh! + Doggie + Sleep + ing" = 4

"Shh! + Doggie + is + Sleep + ing" = 5

"Shh! + The + Doggie + is + Sleep + ing" = 6

SOURCE: COURTESY OF MONICA KALFUR, SLP



meaning. However, grammar becomes essential when babies begin to use two-word combinations (Bremner & Wachs, 2010). That typically happens between 18 and 24 months.

For example, "Baby cry" and "More juice" follow grammatical word order. No child asks, "Juice more," and even toddlers know that "cry baby" is not the same as "baby cry." By age 2, children combine three words. English grammar uses subject–verb–object order. For example, toddlers say "Mommy read book," rather than any of the five other possible sequences of those three words.

Children's proficiency in grammar correlates with the length of their sentences, which is why in every language **mean length of utterance (MLU)** is considered an accurate way to measure a child's language progress (e.g., Miyata et al., 2013). The child who says "Baby is crying" is advanced compared with the child who says "Baby crying" or simply the holophrase "Baby." (See Visualizing Development, p. 192.)

Young children can master two languages, not just one. Children are statisticians: They implicitly track the number of words and phrases and learn those expressed most often, in one, two, or more languages (Johnson & Tyler, 2010). (**Developmental Link:** Bilingual learning is discussed in detail in Chapter 9.) The toddler who often hears two languages will soon speak two languages.

mean length of utterance (MLU) The average number of words and meaningful sounds (such as *-ing* and *huh?*) in a typical sentence (called utterance, because children may not talk in complete sentences). MLU is often used to indicate how advanced a child's language development is.

Theories of Language Learning

Worldwide, people who are not yet 2 years old already speak their native language, or two or three languages if that is what they hear. They can express hopes, fears, and memories, and they continue to learn rapidly: All teenagers communicate with nuanced words and gestures, and some compose lyrics or deliver orations that move thousands of their co-linguists. These impressive accomplishments raise the question: How is language learned so easily and so well?

Answers come from three schools of thought, each connected to a theory introduced in Chapter 2: behaviorism, sociocultural theory, and evolutionary psychology. The first theory says that infants are directly taught, the second that social impulses propel infants to communicate, and the third that infants understand language because of brain advances several millennia ago that allowed survival of our species.

Theory One: Infants Need to Be Taught

The seeds of the first perspective were planted more than 50 years ago, when the dominant theory in North American psychology was behaviorism, or learning theory. The essential idea was that all learning is acquired, step-by-step, through association and reinforcement. Just as Pavlov's dogs learned to associate sound with food, infants may associate objects with words, especially if reinforcement occurs.

B. F. Skinner (1957) noticed that spontaneous babbling is usually reinforced. Typically, every time the baby says "ma-ma-ma-ma," a grinning mother appears, repeating the sound and showering the baby with attention, praise, and perhaps food. The baby learns affordances and repeats "ma-ma-ma-ma" when lonely or hungry; through operant conditioning, talking begins.

Skinner believed that most parents are excellent instructors, responding to their infants' gestures and sounds, thus reinforcing speech (Saxton, 2010). Even in preliterate societies, parents use child-directed speech, responding quickly with high pitch, short sentences, stressed nouns, and simple grammar—exactly the techniques that behaviorists would recommend. In every culture that has been studied, those infants who learn language faster have parents who speak to them often. Few parents know the theory of behaviorism, but many use behaviorist

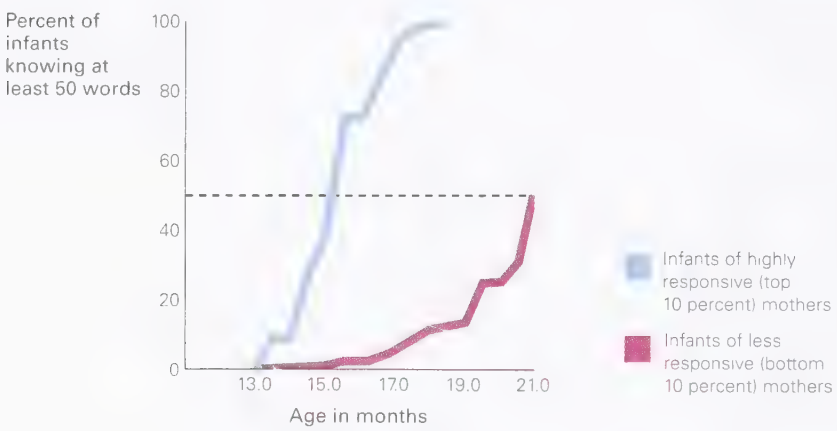
✓ **Response for Caregivers** (from page 190): Not at all. Toddlers hear several people called "Mama" (their own mother, their grandmothers, their cousins' and friends' mothers) and experience mothering from several people, so it is not surprising if they use "Mama" too broadly. They will eventually narrow the label down to one person, unless both their parents are women. Usually such parents differentiate, with one called Mama and the other Mom, or both by their first names.

techniques that Skinner would recommend, because these methods succeed (Tamis-LeMonda et al., 2014).

The core ideas of this theory are the following:

- Parents are expert teachers, although other caregivers help.
- Frequent repetition is instructive, especially when linked to daily life.
- Well-taught infants become well-spoken children.

Behaviorists note that some 3-year-olds converse in elaborate sentences; others just barely put one simple word with another. Such variations correlate with the amount of language each child has heard. Parents of the most verbal children teach language throughout infancy—singing, explaining, listening, responding, and reading to their children every day, even before age 1 (Forget-Dubois et al., 2009) (see Figure 6.2).



Source: Adapted from Tamis-LeMonda et al., 2001, p. 761

FIGURE 6.2

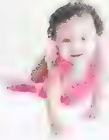
Maternal Responsiveness and Infants' Language Acquisition Learning the first 50 words is a milestone in early language acquisition, as it predicts the arrival of the naming explosion and multiword sentences a few weeks later. Researchers found that half the 9-month-old infants of highly responsive mothers (top 10 percent) reached this milestone at 15 months. The infants of nonresponsive mothers (bottom 10 percent) lagged significantly behind.

In one detailed U.S. study, researchers analyzed a 10-minute sample of the language that mothers used with their 9-month-old infants (Tamis-LeMonda et al., 2001). All the mothers were middle class, from the same nation (to control for SES and culture). One mother never imitated her infant's babbling; another mother imitated 21 times, babbling back in conversation. All mothers described things or actions (e.g., "That is a spoon you are holding—spoon"), but one offered only 4 descriptions while another gave 33 in the 10-minute segment.

The frequency of maternal responsiveness at 9 months predicted language acquisition at 17 months. It was not that noisy infants, whose genes might soon make them verbal, elicited more talk. Some quiet infants had mothers who frequently suggested play activities, described things, and asked questions. Quiet infants with talkative mothers usually became more verbal toddlers than their peers.

According to behaviorists, if adults want children who speak, understand, and (later) read well, they must talk to their infants. A recent application of this theory comes from commercial videos, designed to advance toddlers' vocabulary. Typically, such videos use repetition and attention-grabbing measures (sound, tone, color) to encourage babies to learn new words (Vaala et al., 2010). Such videos, and Skinner's theories, have come under attack from many developmentalists, as explained in the following Opposing Perspectives feature.

Especially for Educators An infant daycare center has a new child whose parents speak a language other than the one the teachers speak. Should the teachers learn basic words in the new language, or should they expect the baby to learn the majority language? (see response, page 196)



opposing perspectives

Language and Video

Toddlers can learn to swim in the ocean, throw a ball into a basket, walk on a narrow path beside a precipice, call on a cell phone, cut with a sharp knife, play a guitar, say a word on a flashcard, recite a poem, utter a curse, and much more—if provided appropriate opportunity, encouragement, and practice. Indeed, toddlers in some parts of the world do each of these things—sometimes to the dismay, disapproval, and even shock of adults from elsewhere. Infants do what others do, a trait that fosters rapid learning and challenges caregivers, who try to keep "little scientists" safe. Since language is crucial, many North American parents hope to accelerate talking and understanding.

Commercial companies recognize that toddlers love learning and that parents are eager to teach. Infants are fascinated by dynamic activity, especially when it includes movement, sound, and people. This explains the popularity of child-directed videos—"like crack for babies," as one mother said (quoted in DeLoache et al., 2010, p. 1572). Such products are named to appeal to parents, such as *Baby Einstein*, *Brainy Baby*, and *Mozart for Mommies and Daddies—Jumpstart Your Newborn's I.Q.*

They are advertised with testimonials. Scientists consider such advertisement deceptive, since one case proves nothing and only controlled experiments prove cause and effect.

In fact, many scientists believe the truth is opposite the commercial claims. A famous study found that infants watching *Baby Einstein* were delayed in language compared to other infants (Zimmerman et al., 2007). The American Association of Pediatricians suggests no screen time (including television, tablets, smartphones, and commercial videos) for children under age 2.

These conclusions are not "robust." That means that some interpretations of the evidence endorse prohibition, but others do not. Some scientists argue that the data are open to many conclusions, depending on the particular statistical analysis used (Ferguson & Donnellan, 2014).

An author of the original critique defended the anti-video findings, arguing that "a reanalysis rooted in dissatisfaction with previous results will necessarily be biased and can only obscure scientific discoveries" (Zimmerman, 2014, p. 138).

Overall, most developmentalists find that, although some educational videos may help older children, videos during infancy are no "substitute for loving, face-to-face relationships" (Lemish & Kolucki, 2013, p. 335). The crucial factor for intellectual growth seems to be caregiver responsiveness to the individual child, face to face (Richert et al., 2011).

More specifically, there is a "transfer deficit" when infants learn from books and video screens, meaning they are less likely to understand and apply what they have learned than if they learned directly from another person (Barr, 2013). One solution is for caregivers to interact more with their infants and ban or limit videos. Another solution, if the parents want the child to learn vocabulary or other material from a book or video, is to let the child see the same two-dimensional presentation again and again. Toddlers often choose to repeat exposure long past the time the parents are bored, a sign that learning at that age requires more repetitions than later on (Barr, 2013).

One product, *My Baby Can Read*, was pulled off the market in 2012 because experts repeatedly attacked its claims, and the cost of defending lawsuits was too high (Ryan, 2012). But many such products are still sold, and new ones appear continually. The owners of *Baby Einstein* lost a lawsuit in 2009, promised not to claim it was educational, and offered a refund, yet, as one critic notes:

> The bottom line is that this industry exists to capitalize on the national preoccupation with creating intelligent children as early as possible, and it has become a multi-million dollar enterprise. Even after . . . the Baby Einstein Company itself admitted its products are not educational, Baby Einstein products continue to fly off of the shelves.
>
> *(Ryan, 2012, p. 784)*

Another study gave videos to one group of parents and none to a control group. They found no evidence that videos could actually teach young babies to read, or even recognize letters, although many parents in this study were enthusiastic about the videos (Neuman et al., 2014).

Is science too cautious or are parents too quick to be swayed by commercial testimony? If a video-watching toddler becomes more verbal, perhaps the timing was a coincidence: All normal babies burst forth with new words at a certain point.

What is your opinion? More importantly, how does your opinion connect to your bias about scientists, or about corporations, or about parents?

Theory Two: Social Impulses Foster Infant Language

The second theory is called *social-pragmatic*. It arises from the sociocultural reason for language: communication. According to this perspective, infants communicate because humans are social beings, dependent on one another for survival and joy. Each culture has practices that further social interaction; talking is one





Same Situation, Far Apart: Before Words
The Polish babies learning sign language (*top*) and the New York infant interpreting a smile (*bottom*) are all doing what babies do: trying to understand communication long before they are able to talk.

such practice. Thus, all infants (and no chimpanzees) master words and grammar to join the social world in which they find themselves (Tomasello & Herrmann, 2010).

According to this perspective, it is the emotional messages of speech, not the words, that propel communication. In one study, people who had never heard English (Shuar hunter-gatherers living in isolation near the Andes Mountains) listened to tapes of North American mothers talking to their babies. The Shuar successfully distinguished speech conveying comfort, approval, attention, and prohibition, without knowing any of the words (Bryant & Barrett, 2007). This study suggests that the social content of speech is universal; therefore, since babies are social creatures, they learn whatever specifics their culture provides.

Suppose an 18-month-old is playing with an unnamed toy and an adult utters a word. Does the child connect that word to the toy? A behaviorist, learning-by-association prediction would be yes, but the answer is no. In an experiment, when toddlers played with a fascinating toy and adults said a word, the toddlers looked up, figured out what the adult was looking at, and assigned the new word to that, not to the fascinating toy (Baldwin, 1993). This supports theory two: The toddlers wanted to know what the adults intended.

Evidence for social learning comes from educational programs for children. Many 1-year-olds enjoy watching television and videos, as the Opposing Perspectives feature on page 195 explains, but they learn best when adults are actively involved in teaching. In a controlled experiment, 1-year-olds learned vocabulary much better when someone taught them directly than when the same person gave the same lesson on video (Roseberry et al., 2009).

According to theory two, then, social impulses, not explicit teaching, lead infants to learn language. According to this theory, people differ from the great apes in that they are social, driven to communicate (Tomasello & Herrmann, 2010).

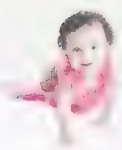
Theory Three: Infants Teach Themselves

A third theory holds that language learning is genetically programmed to begin at a certain age; adults need not teach it (theory one), nor is it a by-product of social interaction (theory two). Instead, it arises from the universal genetic impulse to imitate. Languages have been developed to take advantage of this maturation process. For example, English has articles (*the, an, a*) that signal to the baby that the next word will be the name of an object, and since babies have "an innate base" that primes them to learn, such articles facilitate learning nouns (Shi, 2014, p. 9).

As already explained in the research on memory, infants and toddlers observe what they see and they apply it—not slavishly but according to their own concepts and intentions, which develop as the brain matures. Theory three proposes that this is exactly what they do with the language they hear (Saxton, 2010).

This theory is buttressed by research that finds that variations in children's language ability correlate with differences in brain activity and perceptual ability, evident months before the first words are spoken and apart from the particulars of parental input (Cristia et al., 2014). Some 3-year-olds are far more verbal than others because they were born to be so.

Response for Educators (from page 194): Probably both. Infants love to communicate, and they seek every possible way to do so. Therefore, the teachers should try to understand the baby and the baby's parents, but they should also start teaching the baby the majority language of the school



This perspective began soon after Skinner proposed his theory of verbal learning. Noam Chomsky (1968, 1980) and his followers felt that language is too complex to be mastered merely through step-by-step conditioning. Although behaviorists focus on variations among children in vocabulary size, Chomsky focused on similarities in language acquisition—the universals, not the differences.

Noting that all young children master basic grammar according to a schedule, Chomsky cited this *universal grammar* as evidence that humans are born with a mental structure that prepares them to seek some elements of human language. For example, everywhere, a raised tone indicates a question, and infants prefer questions to declarative statements (Soderstrom et al., 2011). This suggests that infants are wired to have conversations, and caregivers universally ask them questions long before they can answer back.

Chomsky labeled this hypothesized mental structure the **language acquisition device (LAD)**. The LAD enables children, as their brains develop, to derive the rules of grammar quickly and effectively from the speech they hear every day, regardless of whether their native language is English, Thai, or Urdu. On their part, adults, because of their own LAD, instinctively help children learn whatever superficial differences appear between one language and another.

Other scholars agree with Chomsky that all infants are primed, naturally, to understand and speak whatever language they hear. They are eager learners, and speech becomes one more manifestation of neurological maturation (Wagner & Lakusta, 2009). This idea does not strip languages and cultures of their differences in sounds, grammar, and almost everything else, but the basic idea is that "language is a window on human nature, exposing deep and universal features of our thoughts and feelings" (Pinker, 2007, p. 148).

According to theory three, language is experience-expectant, as the developing brain quickly and efficiently connects neurons to support whichever language the infant hears. Because of this experience expectancy, the various languages of the world are all logical, coherent, and systematic. Then some experience-dependent learning occurs as each brain adjusts to a particular language.

Research supports this perspective as well. As you remember, newborns are primed to listen to speech (Vouloumanos & Werker, 2007), and all infants babble *ma-ma* and *da-da* sounds (not yet referring to mother or father). No reinforcement or teaching is required; all a baby needs is time, and that will allow dendrites to grow, mouth muscles to strengthen, neurons to connect, and speech to be heard. This theory might explain why poets put together phrases that they have never heard to produce novel understanding, and why people hear words in their dreams that make no sense. Thus, the language impulse may arise from the brain, not from other people.

Nature even provides for deaf infants. All 6-month-olds, hearing or not, prefer to look at sign language over nonlinguistic pantomime. For hearing infants, this preference disappears by 10 months because their affinity for gestural language is not necessary for communication (Krentz & Corina, 2008). Deaf infants are signing by then, which is their particular expression of LAD, a universal impulse.

A Hybrid Theory

Which of these three perspectives is correct? Perhaps all of them are true, to some extent. In one monograph that included details and results of 12 experiments, the authors presented a hybrid (which literally means "a new creature, formed by combining other living things") of previous theories (Hollich et al., 2000). Since infants learn language to do numerous things—to indicate intention, call objects by name, put words together, talk to family members, sing to themselves, express

Especially for Nurses and Pediatricians
Eric and Jennifer have been reading about language development in children. They are convinced that because language develops naturally, they need not talk to their 6-month-old son. How do you respond? (see response, page 199)

language acquisition device (LAD)
Chomsky's term for a hypothesized mental structure that enables humans to learn language, including the basic aspects of grammar, vocabulary, and intonation.

wishes, remember the past, and much more—some aspects of language learning are best explained by one theory at one age and other aspects by another theory at another age.

Although originally developed to explain acquisition of first words, mostly nouns, this theory also explains learning verbs: Perceptual, social, and linguistic abilities combine to make that possible (Golinkoff & Hirsh-Pasek, 2008). Linguists seek to understand how most children acquire more than one language; it seems that many strategies help (Canagarajah & Wurr, 2011).

One study supporting the hybrid theory began, as did the study previously mentioned, with infants looking at pairs of objects that they had never seen and never heard named. One of each pair was fascinating to babies and the other was boring, specifically "a blue sparkle wand . . . [paired with] a white cabinet latch . . . a red, green, and pink party clacker . . . [paired with] a beige bottle opener" (Pruden et al., 2006, p. 267). The experimenter said a made-up name (not an actual word), and then the infants were tested to see whether they assigned the new word to the object that had the experimenter's attention (the dull one) or to the one that was interesting to them.

Unlike the similar study already described, which involved 18-month-olds, the participants in this one were 10-month-olds. They responded differently than the older infants did. The 10-month-olds seemed to assign the word to the fascinating object, not the dull one. These researchers' interpretation was that *how* language is learned depends on the age of the child as well as on the particular circumstances. Behaviorism may work for young children, social learning for slightly older ones: "The perceptually driven 10-month-old becomes the socially aware 19-month-old" (Pruden et al., 2006, p. 278).

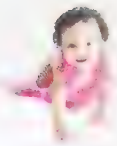
Current thinking is that children are not exclusively social learners or behaviorists and that learning a new word or grammar form is not an all-or-none accomplishment. Instead, partial learning occurs: A lack of evident mastery of a word makes it easier to learn that word or a related word later on (Yurovsky et al., 2014).

This may be easier to understand with an example. Suppose a 1-year-old meets an unfamiliar child named Tom and fails to say his name or wave "bye-bye Tom" when asked. That might be considered failure—Chomsky might say the child was not ready, Skinner might say the child was not sufficiently reinforced, social learning theorists might say that Tom was not socially important.

But then, a week later, the child might see Tom again, hear that his name is Tom, and immediately say "Tom." The likely explanation is that partial learning occurred the first time, so the second time it became evident. Such experiences are common: A toddler might surprise everyone by saying a word that was heard earlier. Learning is more likely if all three factors (reinforcement, social impulses, maturation) combine.

After intensive study, yet another group of scientists also endorsed a hybrid theory, concluding that "multiple attentional, social, and linguistic cues" contribute to early language (Tsao et al., 2004, p. 1081). It makes logical and practical sense for nature to provide several paths toward language learning and for various theorists to emphasize one or another of them (Sebastián-Gallés, 2007).

It also seems that some children learn better one way and others another way (Goodman et al., 2008), and that families and cultures vary in how they teach. Since every human must learn language, nature allows diversity in specifics so that the goal is always attained. Ideally, parents talk often to their infants (theory one), encourage social interaction (theory two), and appreciate the innate abilities of the child (theory three).



As one expert concludes:

> our best hope for unraveling some of the mysteries of language acquisition rests with approaches that incorporate multiple factors, that is, with approaches that incorporate not only some explicit linguistic model, but also the full range of biological, cultural, and psycholinguistic processes involved.
>
> *[Tomasello, 2006, pp. 292–293]*

The idea that every theory is correct may seem idealistic. However, many scientists who are working on extending and interpreting research on language acquisition arrive at a similar conclusion. They contend that language learning is neither the direct product of repeated input (behaviorism) nor the result of a specific human neurological capacity (LAD). Rather, from an evolutionary perspective, "different elements of the language apparatus may have evolved in different ways," and thus, a "piecemeal and empirical" approach is needed (Marcus & Rabagliati, 2009, p. 281). In other words, no single theory explains how babies learn language: Humans accomplish this feat in many ways.

What conclusion can we draw from all the research on infant cognition? It is clear that infants are active learners of language and concepts and that they seek to experiment with objects and find ways to achieve their goals. This is the cognitive version of the biosocial developments noted in Chapter 5, that babies strive to roll over, crawl, walk, and so on as soon as they can. (See Visualizing Development, p. 192.)

SUMMING UP From the first days of life, babies attend to words and expressions, responding as well as their limited abilities allow—crying, cooing, and soon babbling. Before age 1, they understand simple words and communicate with gestures. At 1 year, most infants speak a few words in their native language. Vocabulary builds slowly at first but then more rapidly as the holophrase, the naming explosion, and then the two-word sentence appear.

The impressive language learning of the first two years can be explained in many ways: that caregivers must teach language, that infants learn because they are social beings, that inborn cognitive capacity propels infants to acquire language as soon as maturation makes that possible. Because infants vary in culture, learning style, and social context, a hybrid theory contends that each theory may be valid for explaining some aspects of language learning at some ages.

WHAT HAVE YOU LEARNED?

1. What communication abilities do infants have before they talk?
2. What aspects of early language development are universal, apparent in every culture?
3. What is typical of the first words that infants speak and the rate at which they acquire them?
4. What are the early signs of grammar in infant speech?
5. According to behaviorism, how do adults teach infants to talk?
6. According to sociocultural theory, why do infants try to communicate?
7. What does the idea that child speech results from brain maturation imply for caregivers?

Response for Nurses and Pediatricians (from page 197): Although humans may be naturally inclined to communicate with words, exposure to language is necessary. You may not convince Eric and Jennifer, but at least convince them that their baby will be happier if they talk to him.

SUMMARY

Sensorimotor Intelligence

1. Piaget realized that very young infants are active learners who seek to understand their complex observations and experiences. The six stages of sensorimotor intelligence involve early adaptation to experience.
2. Sensorimotor intelligence begins with reflexes and ends with mental combinations. The six stages occur in pairs, with each pair characterized by a circular reaction; infants first react to their own bodies (primary), then respond to other people and things (secondary), and finally, in the stage of tertiary circular reactions, infants become more goal-oriented, creative, and experimental as "little scientists."
3. Infants gradually develop an understanding of objects. According to Piaget's classic experiments, infants understand object permanence and begin to search for hidden objects at about 8 months.
4. Newer research, using brain scans and other methods, finds that Piaget underestimated infant cognition. His conclusions about when infants understand object permanence and when they defer imitation have been revised.

Information Processing

5. Another approach to understanding infant cognition involves information-processing theory, which looks at each step of the thinking process, from input to output. The perceptions of a young infant are attuned to the particular affordances, or opportunities for action, that are present in the infant's world.
6. Objects, creatures, and especially people that move are particularly interesting to infants because they afford many possibilities for interaction and perception. From a baby's perspective, the world is filled with exciting opportunities for learning; adults may be more cautious.
7. Infant memory is fragile but not completely absent. Reminder sessions help trigger memories, and young brains learn motor sequences and respond to repeated emotions (their own and those of other people) long before they can remember with words.
8. Memory is multifaceted; infant amnesia is a myth. At about 9 months, infant memories improve. Repetition is especially important for infant memory.

Language: What Develops in the First Two Years?

9. Language learning, which distinguishes the human species from other animals, is an amazing infant accomplishment. By age 2, babies are talking to express wishes and memory, as well as what they experience at the moment.
10. Attempts to communicate are apparent in the first weeks and months. Infants babble at about 6 months, understand words and gestures by 10 months, and speak their first words at about 1 year. Deaf infants make their first signs before 1 year.
11. Vocabulary builds slowly until the infant knows approximately 50 words. Then the naming explosion begins.
12. Toward the end of the second year, toddlers put words together in short sentences. The tone of holophrases is evidence of grammar, but putting two or three words together in proper sequence is proof.
13. Various theories explain how infants learn language as quickly as they do. The three main theories emphasize different aspects of early language learning: that infants must be taught, that their social impulses foster language learning, and that their brains are genetically attuned to language as soon as the requisite maturation has occurred.
14. Each theory of language learning is confirmed by some research. The challenge for developmental scientists has been to formulate a hybrid theory that uses all the insights and research on early language learning. The challenge for caregivers is to respond to the infant's early attempts to communicate, expecting neither too much nor too little.

KEY TERMS

sensorimotor intelligence (p. 173)
primary circular reactions (p. 173)
secondary circular reactions (p. 174)
object permanence (p. 175)
tertiary circular reactions (p. 176)
"little scientist" (p. 176)
deferred imitation (p. 177)
habituation (p. 179)
fMRI (p. 179)
information-processing theory (p. 180)
affordance (p. 181)
visual cliff (p. 182)
dynamic perception (p. 182)
people preference (p. 183)
reminder session (p. 185)
child-directed speech (p. 188)
babbling (p. 188)
holophrase (p. 189)
naming explosion (p. 190)
grammar (p. 191)
mean length of utterance (MLU) (p. 193)
language acquisition device (LAD) (p. 197)

APPLICATIONS

1. Elicit vocalizations from an infant—babbling if the baby is under age 1, words if the baby is older. Write down all the baby's communication for 10 minutes. Then ask the primary caregiver to elicit vocalizations for 10 minutes, and write these down. What differences are apparent between the baby's two attempts at communication? Compare your findings with the norms described in the chapter.
2. Piaget's definition of *intelligence* is "adaptation." Others consider a good memory or an extensive vocabulary to be a sign of intelligence. How would you define intelligence? Give examples.
3. Many educators recommend that parents read to babies every day, even before 1 year of age. What theory of language development does this reflect and why? Ask several parents if they did so, and why or why not.
4. Test an infant's ability to search for a hidden object. Ideally, the infant should be about 7 or 8 months old, and you should retest over a period of weeks. If the infant can immediately find the object, make the task harder by pausing between hiding and searching or by moving the object from one hiding place to another.



CHAPTER 7



The First Two Years: Psychosocial Development

What Will You Learn?

1. How do smiles, tears, anger, and fear change from birth to age 2?
2. Does a baby's temperament predict lifelong personality?
3. What are the signs of a secure attachment between parent and infant?
4. What are opposing theories about the development of infant emotions?
5. Do babies benefit or suffer when they are placed in infant day care?

My 1-week-old grandson cried. Often. Again and again. Day and night. For a long time. Again. He and his parents were staying with me for a few months. I was not the caregiver, so I didn't mind the crying for myself. But I did mind for my sleep-deprived daughter.

And I worried about her husband. He spent many hours, day and night, carrying my grandson while my daughter slept.

"It seems to me that you do most of the baby-comforting," I told him.

"That's because Elissa does most of the breast-feeding," he answered with a smile.

This chapter opens by tracing infants' emotions as their brains mature and their experiences accumulate, and it notes temperamental and cultural differences. All babies cry early on, but soon their emotions take many forms. This discussion leads to an exploration of caregiver–infant interaction, particularly *synchrony*, *attachment*, and *social referencing*. For every aspect of caregiving, fathers as well as mothers are included, a change from a few decades ago.



COURTESY OF KATHLEEN BERGER

Now Happy Asa How does a crying baby become a happy toddler? A clue is here: devoted father and grandfather.

Then we apply each of the five theories introduced in Chapter 2, not only to understand infant emotions but also to consider a controversial topic: Who should be the caregivers? Families and cultures answer this question in many ways. Fortunately, as this chapter explains, although temperaments and caregivers vary, most infants (including my now-happy grandson) thrive, as long as their basic physical and emotional needs are met.

- Emotional Development
  - Early Emotions
  - Toddlers' Emotions
- Brain and Emotions
  - Growth of the Brain
  - Temperament
- The Development of Social Bonds
  - Synchrony
  - Attachment
  - Insecure Attachment and the Social Setting
  - Social Referencing
  - Fathers as Social Partners
- Theories of Infant Psychosocial Development
  - Psychoanalytic Theory
  - Behaviorism
  - Cognitive Theory
  - Humanism
  - Evolutionary Theory
- Infant Day Care
  - Many Choices
  - A VIEW FROM SCIENCE: The Mixed Realities of Center Day Care
  - A Stable, Familiar Pattern

Emotional Development

In their first two years, infants progress from reactive pain and pleasure to complex patterns of social awareness (see At About This Time), a movement from basic instinctual emotions to learned and then thoughtful ones (Panksepp & Watt, 2011). Infant emotions arise more from the body than from thought, so speedy, uncensored reactions—crying, startling, laughing, raging—are common.

at about this time

Developing Emotions

Birth	Distress; contentment
6 weeks	Social smile
3 months	Laughter; curiosity
4 months	Full, responsive smiles
4–8 months	Anger
9–14 months	Fear of social events (strangers, separation from caregiver)
12 months	Fear of unexpected sights and sounds
18 months	Self-awareness; pride; shame; embarrassment

As always, culture and experience influence the norms of development. This is especially true for emotional development after the first eight months.

Early Emotions

At first there is pleasure and pain. Newborns are happy and relaxed when fed and drifting off to sleep. They cry when they are hurt or hungry, tired or frightened (as by a loud noise or a sudden loss of support).

Some infants have bouts of uncontrollable crying, called *colic*, probably from immature digestion; some have *reflux*, probably from immature swallowing. About 20 percent of babies cry "excessively," more than three hours a day, for more than three days a week, for more than three weeks (J. S. Kim, 2011).

Smiling and Laughing

Soon, additional emotions become recognizable. Curiosity is evident as infants (and people of all ages) respond to objects and experiences that are new but not too novel. Happiness is expressed by the **social smile,** evoked by a human face at about 6 weeks. Preterm babies smile a few weeks later because the social smile is affected by age since conception, not age since birth.

social smile A smile evoked by a human face, normally first evident in infants about 6 weeks after birth.

cortisol The primary stress hormone; fluctuations in the body's cortisol level affect human emotions.

Infants worldwide express social joy, even laughter, between 2 and 4 months (Konner, 2007; Lewis, 2010). Laughter builds as curiosity does; a typical 6-month-old laughs loudly upon discovering new things, particularly social experiences that balance familiarity and surprise, such as Daddy making a funny face. They prefer looking at happy faces over sad ones, even if the happy faces are not looking at them (Kim & Johnson, 2013).



CHRISTOPHER HERWIG/GETTY IMAGES

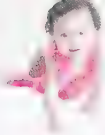
Smiles All Around Joy is universal when an infant smiles at her beaming grandparents—a smile made even better when the tongue joins in. This particular scene took place in Kazakhstan in central Asia.

Anger and Sadness

The positive emotions of joy and contentment are soon joined by negative emotions, which are expressed more often in infancy than later on (Izard, 2009). Anger is evident at 6 months, usually triggered by frustration, such as when infants are prevented from moving or grabbing.

To investigate infants' response to frustration, researchers "crouched behind the child and gently restrained his or her arms for 2 minutes or until 20 seconds of hard crying ensued" (Mills-Koonce et al., 2011, p. 390). "Hard crying" was not infrequent: Infants hate to be strapped in, caged in, closed in, or even just held in place when they want to explore. In that study, frustrated infants whose fathers were less nurturant tended to be quicker to react with elevated **cortisol,** the stress hormone—an indication that the infants were already developing learned emotional reactions.

In infancy, anger is generally a healthy response to frustration, unlike sadness, which also appears in the first months. Sadness indicates withdrawal and is accompanied by a greater increase in the body's production of cortisol.



This is one conclusion from experiments in which 4-month-olds were taught to pull a string to see a picture, which they enjoyed—not unlike the leg-kicking study to move the mobile, described in Chapter 6. Then the string was disconnected. Most babies reacted by angrily jerking the string. Some, however, quit trying and looked sad (Lewis & Ramsay, 2005); their cortisol rose markedly. This suggests that some babies learn, to their sorrow, to repress their anger.

Since sadness produces physiological stress (measured by cortisol levels), sorrow negatively impacts the infant. All social emotions, particularly sadness and fear, probably shape the brain (Fries & Pollak, 2007; M. H. Johnson, 2011). As you learned in Chapter 5, experience matters. Sad and angry infants whose mothers are depressed become fearful toddlers (Dix & Yan, 2014). Too much sadness early in life correlates with depression later on.

Fear

Fear in response to some person, thing, or situation (not just being startled in surprise) is evident at about 9 months and soon becomes more frequent and obvious. Two kinds of social fear are typical:

Separation anxiety—clinging and crying when a familiar caregiver is about to leave

Stranger wariness—fear of unfamiliar people, especially when they move too close, too quickly

separation anxiety An infant's distress when a familiar caregiver leaves; most obvious between 9 and 14 months.

stranger wariness An infant's expression of concern—a quiet stare while clinging to a familiar person, or a look of fear—when a stranger appears.

Separation anxiety is normal at age 1, intensifies by age 2, and usually subsides after that. Fear of separation interferes with infant sleep. For example, infants who fall asleep next to familiar people may wake up frightened if they are alone (Sadeh et al., 2010). The solution is not necessarily to sleep with the baby, but neither is it to ignore the child's natural fear of separation. (**Developmental Link:** Co-sleeping and bed-sharing are discussed in Chapter 5.)

Some babies are comforted by a "transitional object," such as a teddy bear or blanket beside them, as they transition from sleeping in their parents' arms to sleeping alone. Music, a night light, an open door, may all ease the fear.

Transitional objects are not pathological; they are the infant's way of coping with anxiety. However, if separation anxiety remains strong after age 3 and impairs the child's ability to leave home, go to school, or play with friends, it is considered an emotional disorder. Separation anxiety as a disorder can be diagnosed at any age and is quite different from the "strong interdependence among family members," which is normative in some cultures (American Psychiatric Association, 2013, p. 193).

Separation anxiety may be apparent outside the home. Strangers—especially those who do not resemble or move like familiar caregivers—merit stares, not smiles, at age 1. This is a good sign: Infant memory is active and engaged. Fear of strangers is normative, which means that every toddler typically manifests it, but genes and parents make it stronger (with tears and hiding) or weaker (with a wary look). Children whose parents are themselves anxious are likely to fear new people throughout childhood (Brooker et al., 2013).

Many normal 1-year-olds fear anything unexpected, from the flush of the toilet to the pop of a jack-in-the-box, from closing elevator doors to the tail-wagging approach of a dog. With repeated experience and reassurance, older infants might enjoy flushing the toilet (again and again) or calling the dog (and might cry if the dog does *not* come). Note the transition from instinct to learning to thought (Panksepp & Watt, 2011).

Every aspect of early emotional development interacts with cultural beliefs, expressed in parental actions. There seems to be more separation anxiety and



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Developmentally Correct Both Santa's smile and Olivia's grimace are appropriate reactions for people of their age. Adults playing Santa must smile no matter what, and if Olivia smiled, that would be troubling to anyone who knows about 7-month-olds. Yet every Christmas, thousands of parents wait in line to put their infants on the lap of oddly dressed, bearded strangers.

Especially for Nurses and Pediatricians Parents come to you concerned that their 1-year-old hides her face and holds onto them tightly whenever a stranger appears. What do you tell them? (see response, page 207)

stranger wariness in Japan than in Germany because Japanese infants "have very few experiences with separation from the mother," whereas in German towns, "infants are frequently left alone outside of stores or supermarkets" while their mothers shop (Saarni et al., 2006, p. 237).

Toddlers' Emotions

Emotions take on new strength during toddlerhood, as both memory and mobility advance (Izard, 2009). For example, throughout the second year and beyond, anger and fear become less frequent but more focused, targeted toward infuriating or terrifying experiences. Similarly, laughing and crying are louder and more discriminating.

The new strength of emotions is apparent in temper tantrums. Toddlers are famous for fury. When something angers them they might yell, scream, cry, hit, and throw themselves on the floor. Logic is beyond them; if adults respond with anger or teasing, that makes it worse.

One child was angry at her feet and said she did not want them. When a parent offered to get scissors and cut them off, a new wail of tantrum erupted. With temper tantrums, soon sadness comes to the fore, at which time comfort—rather than acquiescence or punishment—is helpful (Green et al., 2011).

Social Awareness

Temper can be seen as an expression of selfhood. So can new toddler emotions: pride, shame, jealousy, embarrassment, disgust, and guilt. These emotions require social awareness, which typically emerges from family interactions. For instance, in a study of infant jealousy, when mothers deliberately paid attention to another infant, babies moved closer to their mothers, bidding for attention. Brain activity also registered social awareness (Mize et al., 2014).

Culture is crucial here, with independence a value in some families but not in others. Many North American parents encourage toddler pride (saying, "You did it yourself" —even when that is untrue), but Asian families typically cultivate modesty and shame. Such differences may still be apparent in adult personality and judgment. Are you more likely to be annoyed at people who brag or who say they failed? Probably family values taught you that reaction.

Disgust is also strongly influenced by other people as well as by maturation. According to a study that involved many children of various ages, many 18-month-olds (but not younger infants) express disgust at touching a dead animal. None, however, are yet disgusted when a teenager curses at an elderly person—something that parents and older children often find disgusting (Stevenson et al., 2010).

Self-Awareness

self-awareness A person's realization that he or she is a distinct individual whose body, mind, and actions are separate from those of other people.

In addition to social awareness, another foundation for emotional growth is **self-awareness,** the realization that one's body, mind, and activities are distinct from those of other people (Kopp, 2011). Closely following the new mobility that results from walking is an emerging sense of "me" and "mine" that leads the infant to develop a new consciousness of others at about age 1.

Very young infants have no sense of self—at least of *self* as most people define it, but self-awareness grows during toddlerhood with

> self-referential emotions . . . . By the end of the second year [about 20 months] and increasingly in the third [after 24 months], the simple joy of success becomes accompanied by looking and smiling to an adult and calling attention to the feat; the simple sadness of failure becomes accompanied either by avoidance of eye contact with the adult and turning away or by reparative activity and confession.
>
> *[Thompson, 2006, p. 79]*

In a classic experiment (Lewis & Brooks, 1978), 9- to 24-month-olds looked into a mirror after a dot of rouge had been surreptitiously put on their noses. If they reacted by touching the red dot on their noses, that meant they knew the mirror showed their own faces. None of the babies younger than 12 months did that, although they sometimes smiled and touched the dot on the "other" baby in the mirror.

However, at some time between 15 and 24 months, babies become self-aware, touching their noses with curiosity and puzzlement. Self-recognition in the mirror/rouge test (and in photographs) usually emerges at about 18 months, along with two other advances: pretending and using first-person pronouns (*I, me, mine, myself, my*) (Lewis, 2010).

As another scholar explains it, "an explicit and hence reflective conception of the self is apparent at the early stage of language acquisition at around the same age that infants begin to recognize themselves in mirrors" (Rochat, 2013, p. 388). This is yet another example of the interplay of all the infant abilities—walking, talking, and emotional self-understanding all work together to make the 18-month-old a quite different person from the 8-month-old.



My finger, my body, and me Mirror self-recognition is particularly important in her case, as this 2-year-old has a twin sister. Parents need to make sure each child develops his or her own identity. Parents may enjoy dressing twins alike, and giving them rhyming names, but each baby needs to forge an identity.

SUMMING UP A newborn's emotions are distress and contentment, expressed by crying or looking relaxed. The social smile is evident at about 6 weeks. Curiosity, laughter, anger (when infants are kept from something they want), and fear (when something unexpected occurs) soon appear, becoming evident in the latter half of the first year. At about a year, separation anxiety and stranger wariness peak, gradually fading as the child grows older. Toddlers become conscious that they are individuals apart from other individuals sometime after 15 months, and that allows them to experience and express many emotions that indicate self-awareness and awareness of other people's reactions to them. Throughout infancy, cultural expectations and parental actions shape emotions.

WHAT HAVE YOU LEARNED?

1. What are the first emotions to appear in infants?
2. What experiences trigger anger and sadness in infants?
3. What do typical 1-year-olds fear?
4. How do emotions differ between the first and second year of life?
5. What is the significance of the toddler's reaction to seeing herself in the mirror?

LaunchPad



Video Activity: Self-Awareness and the Rouge Test shows the Rouge Test, which assesses how and when self-awareness appears in infancy.

Brain and Emotions

Brain maturation is involved in the developments just described because all reactions begin in the brain (Johnson, 2011). Experience promotes specific connections between neurons and emotions.

Links between expressed emotions and brain growth are complex and thus difficult to assess and describe (Lewis, 2010). Compared with the emotions of adults, discrete emotions during early infancy are murky and unpredictable. The growth of synapses and dendrites is a likely explanation for the gradual refinement and expression of discrete emotions, the result of past experiences and ongoing maturation.

Growth of the Brain

Many specific aspects of brain development support social emotions (Lloyd-Fox et al., 2009). For instance, the social smile and laughter appear as the cortex matures

Response for Nurses and Pediatricians (from page 205): Stranger wariness is normal up to about 14 months. This baby's behavior actually might indicate secure attachment!

(Konner, 2010). The same is probably true for fear, self-awareness, and anger. The brains of 8-month-olds respond to other people who look or act afraid, and that probably enhances the infant's own expression of fear (Missana et al., 2014).

Cultural differences become encoded in the infant brain, called "a cultural sponge" by one group of scientists (Ambady & Bharucha, 2009, p. 342). It is difficult to measure exactly how infant brains are molded by their context, in part because parents are reluctant to allow the brains of their normally developing infants to be scanned.

One study (Zhu et al., 2007) of adults—half born in the United States and half in China—found that a particular area of the brain (the medial prefrontal cortex) was activated for both groups when the adults judged whether certain adjectives applied to them. However, when asked whether those adjectives applied to their mothers, that brain area was activated only for the Chinese participants.

Researchers consider this United States-versus-China finding to be "neuroimaging evidence that culture shapes the functional anatomy of self-representation" (Zhu et al., 2007, p. 1310). They speculate that brain activation occurs because the Chinese participants learned, as babies, that they are closely aligned with their mothers, whereas the Americans learned to be independent.

Beyond culture, an infant's brain activity interacts with caregiver responses, probably in the first months of life as well as through the years of childhood (Nelson et al., 2014). Highly reactive 15-month-olds (who were quick to cry) with responsive caregivers (not hostile or neglectful) became less fearful, less angry, and so on. By age 4, they were able to regulate their emotions, presumably because they had developed neurological links between brain excitement and emotional response. In contrast, highly reactive toddlers whose caregivers were less responsive were often overwhelmed by emotions later on (Ursache, et al., 2013). Differential susceptibility is apparent: Innate reactions and caregiver actions together sculpt the brain.

Learning About Others

The tentative social smile of 2-month-old infants to any face soon becomes a quicker and fuller smile when they see a familiar, loving caregiver. This occurs because, with repeated experience, the neurons that fire together become more closely and quickly connected to each other (via dendrites).

Social preferences form in the early months, connected not only with a person's face, but also with voice, touch, and smell. Early social awareness is one reason adopted children ideally join their new parents in the first days of life (a marked change from 100 years ago, when adoptions began after age 1).

Social awareness is also a reason to respect an infant's reaction to a babysitter: If a 6-month-old screams and clings to the parent when the sitter arrives, another caregiver probably needs to be found. (Do not confuse this reaction with separation anxiety at 12 months—a normal, expected reaction to everyone.)

Every experience that a person has—especially in the early days and months—activates and prunes neurons, such that the firing patterns from one axon to a dendrite reflect past learning. As illustrated in Visualizing Development in Chapter 5, p. 144, this was first shown dramatically with baby mice: Some were licked and nuzzled by their mothers almost constantly, and some were neglected. A mother mouse's licking of her newborn babies reduced methylation of a gene (Nr3c1), which allowed more serotonin (a neurotransmitter) to be released by the hypothalamus (a region of the brain discussed in Chapter 8).

Serotonin not only increased momentary pleasure (mice love being licked) but also started a chain of epigenetic responses to reduce cortisol from many parts of

the brain and body, including the adrenal glands. The effects on both brain and behavior are lifelong for mice and probably for humans as well.

For many humans, social anxiety is stronger than any other anxieties. Certainly to some extent this is genetic. But epigenetic research finds environmental influences important as well. This was clearly shown in a longitudinal study of 1,300 adolescents (twins and siblings): Their genetic tendency toward anxiety was evident at every age, but life events affected how strong that anxiety was felt (Zavos et al., 2012).

A smaller study likewise found that if the infant of an anxious biological mother is raised by a responsive adoptive mother who is not anxious, the inherited anxiety does not materialize (Natsuaki et al., 2013). Parents need to be comforting (as with the nuzzled baby mice) but not overprotective. Fearful mothers tend to raise fearful children, but fathers who offer their infants exciting but not dangerous challenges (such as a game of chase, crawling on the floor) reduce later anxiety (Majdandžić et al., 2013).

Stress

Emotions are connected to brain activity and hormones, but the connections are complicated; they are affected by genes, past experiences, hormones, and neurotransmitters not yet understood (Lewis, 2010). One link is clear: Excessive fear and stress harms the developing brain. The hypothalamus (discussed further in Chapter 8), in particular, grows more slowly if an infant is often frightened.

Brain scans of children who were maltreated in infancy show abnormal responses to stress, anger, and other emotions later on, including to photographs of frightened people. Some children seem resilient, but many areas of the brain (the hypothalamus, the amygdala, the HPA axis, the hippocampus, and the prefrontal cortex—all explained in later chapters) are affected by abuse, especially if the maltreatment begins in infancy (Bernard et al., 2014; Cicchetti, 2013a).

Since early caregiving affects the brain lifelong, caregivers need to be consistent and reassuring. This is not always easy. Remember that some infants cry inconsolably in the early weeks. As one researcher notes:

> An infant's crying has 2 possible consequences: it may elicit tenderness and desire to soothe, or helplessness and rage. It can be a signal that encourages attachment or one that jeopardizes the early relationship by triggering depression and, in some cases, even neglect or abuse.
>
> *[J. S. Kim, 2011, p. 229]*

Sometimes mothers are blamed, or blame themselves, when an infant cries. This attitude is not helpful: A mother who feels guilty or incompetent may become angry at her baby, which leads to unresponsive parenting, an unhappy child, and then hostile interactions. Presumably the results would be the same if the father, or grandmother, were the primary caregiver, although extensive research on those infant-caregiver relationships has not yet been published. Years later, first-grade classmates and teachers are likely to consider children of unresponsive mothers disruptive and aggressive (Lorber & Egeland, 2011).

But the opposite may occur if early crying produces solicitous parenting. Then, when the baby outgrows the crying, the parent–child bond may be exceptionally strong.

Synesthesia

Brain maturation may affect an infant's ability to differentiate emotions—for instance, distinguishing between fear and joy. Some infants seem to cry at everything.



PETER CASOLINO/A_AMY

No Tears Needed In the first weeks of life, babies produce no tears. However, sadness is obvious–unlike adults who might smile while tears betray them. Given what is known about the infant brain, we hope photography did not postpone baby-comforting.

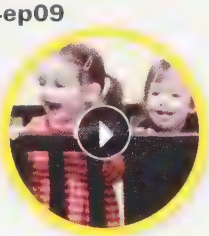
Early emotional confusion seems similar to *synesthesia*, a phenomenon in which one sense triggers another in the brain. For older children and adults, the most common form of synesthesia is when a number or letter evokes a vivid color. Among adults, synesthesia is unusual; often, it is partly genetic and indicates artistic creativity (K. J. Barnett et al., 2008).

Synesthesia seems more common in infants because the boundaries between the sensory parts of the cortex are still forming (Walker et al., 2010). Textures seem associated with vision, sounds with smells, and the infant's own body seems connected to the bodies of others.

These sensory connections allow *cross-modal perception*, when a sensation from one mode (such as a sound) is also experienced in another mode (such as sight). A caregiver's smell and voice may evoke a vision of that person, for instance, or a sound may be connected with a shape. For example, when 4-month-old infants hear words that seem more staccato—such as "kiki"—they are more likely to look at an angular shape than a round one (Ozturk et al., 2013).

The tendency of one part of the brain to activate another may also occur for emotions. An infant's cry can be triggered by pain, fear, tiredness, surprise, or excitement; laughter can turn to tears. Discrete emotions during early infancy are more difficult to recognize, differentiate, or predict than the same emotions in adulthood; infant emotions erupt, increase, or disappear for unknown reasons (Camras & Shutter, 2010). Brain immaturity is a likely explanation.

Video: Temperament in Infancy and Toddlerhood
http://qrs.ly/j44ep09



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temperament Inborn differences between one person and another in emotions, activity, and self-regulation. It is measured by the person's typical responses to the environment.

Temperament

Temperament is defined as the "biologically based core of individual differences in style of approach and response to the environment that is stable across time and situations" (van den Akker et al., 2010, p. 485). "Biologically based" means that these traits originate with nature, not nurture.

Confirmation that temperament arises from the inborn brain comes from an analysis of the tone, duration, and intensity of infant cries after the first inoculation, before much experience outside the womb. Cry variations at this very early stage correlate with later temperament (Jong et al., 2010).

Temperament is *not* the same as personality, although temperamental inclinations may lead to personality differences. Generally, personality traits (e.g., honesty and humility) are learned, whereas temperamental traits (e.g., shyness and aggression) are genetic. Of course, for every trait, nature and nurture interact.

Stranger Danger Some parents teach their children to be respectful of any adult; others teach them to fear any stranger. No matter what their culture or parents say, each of these two sisters in Nepal reacts according to her inborn temperament.



BLJ BACHMANN DANTAGNAN.COM

The New York Longitudinal Study

In laboratory studies of temperament, infants are exposed to events that are frightening or attractive. Four-month-olds might see spinning mobiles or hear unusual sounds. Older babies might confront a noisy, moving robot or a clown who quickly moves close to them. During such experiences, some children laugh, some cry, others are quiet, and still others exhibit some combination of these reactions that might be signs of one of four types of babies: easy (40%), difficult (10%), slow-to-warm-up (15%), and hard-to-classify (35%).

These categories originate from the *New York Longitudinal Study* (NYLS). Begun in the 1960s, the NYLS was the first large study to recognize that each newborn has distinct inborn traits (Thomas & Chess, 1977). According to the NYLS, by 3 months, infants manifest nine traits that cluster into the four categories just listed.



Although the NYLS began a rich research endeavor, its nine dimensions have not held up in later studies. Generally, only three (not nine) dimensions of temperament are found (Hirvonen et al., 2013; van den Akker et al., 2010; Degnan et al., 2011), each of which affects later personality and school performance. The following three dimensions of temperament are apparent:

Effortful control (able to regulate attention and emotion, to self-soothe)
Negative mood (fearful, angry, unhappy)
Exuberant (active, social, not shy)

Each of these dimensions is associated with distinctive brain patterns as well as behavior, with the last of these (exuberance versus shyness) most strongly traced to genes (Wolfe et al., 2014).

Since these temperamental traits are apparent at birth, some developmentalists seek to discover which alleles affect specific emotions (M. H. Johnson & Fearon, 2011). For example, researchers have found that the 7-repeat allele of the DRD4 VNTR gene, when combined with the 5-HTTLPR genotype, results in 6-month-olds who are difficult —they cry often, are hard to distract, and are slow to laugh (Holmboe et al., 2011). Infants with a particular allele of the MOA gene are quick to anger. You need not remember the letters of these alleles, but remember that infant emotions vary, partly for genetic reasons.

One longitudinal study analyzed temperament in the same children at 4, 9, 14, 24, and 48 months and in middle childhood, adolescence, and adulthood. The scientists designed laboratory experiments with specifics appropriate for the age of the children; collected detailed reports from the mothers and later from the participants themselves; and gathered observational data and physiological evidence, including brain scans. Past data were reevaluated each time, and cross-sectional and international studies were considered (Fox et al., 2001, 2005, 2013; Hane et al., 2008; L. R. Williams et al., 2010; Jarcho et al., 2013).

Half of the participants did not change much over time, reacting the same way and having similar brain-wave patterns when confronted with frightening experiences. Curiously, the participants most likely to change from infancy to age 4 were the inhibited, fearful ones. Least likely to change were the exuberant babies (see Figure 7.1). Apparently, adults coax frightened infants to be brave but let exuberant children stay happy.

The researchers found unexpected gender differences. As teenagers, the formerly inhibited boys were more likely than the average adolescent to use drugs, but the inhibited girls were less likely to do so (L. R. Williams et al., 2010). The most likely explanation is cultural: Shy boys seek to become less anxious by drinking alcohol, smoking marijuana, or snorting cocaine, but shy girls may be more accepted as they are, or more likely to obey their parents.

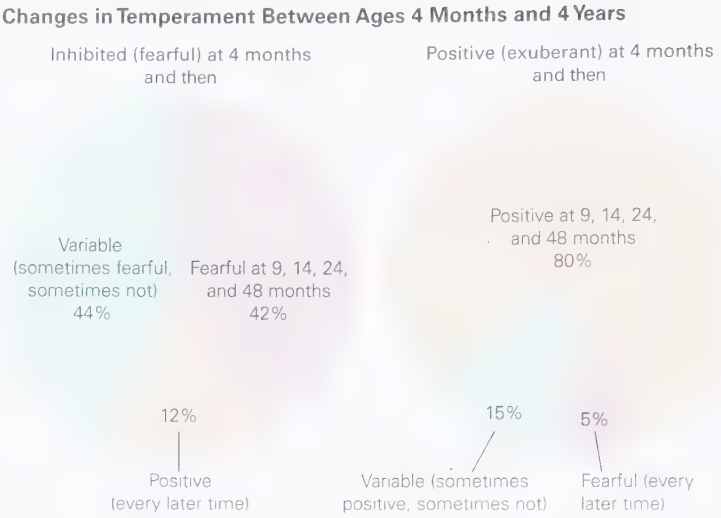
Examination of these children in adulthood found intriguing differences between brain and behavior. Those who were inhibited in childhood still showed, in brain scans, evidence of their infant temperament. That confirms that biology affected their traits. However, learning (specifically cognitive control) was evident: Their behavior was similar to those with a more outgoing temperament, unless other factors caused serious emotional problems. Apparently, most of them had learned to override their initial temperamental reactions—not to erase their innate impulses, but to keep them from impairing adult action (Jarcho et al., 2013).

Continuity and change were also evident in another study that found that angry infants were likely to make their mothers hostile toward them, and, if that happened, such infants became antisocial children. However, if the mothers were loving and patient, despite the difficult temperament of the children, hostile traits were not evident later on (Pickles et al., 2013).

Especially for Nurses Parents come to you with their fussy 3-month-old. They say they have read that temperament is "fixed" before birth, and they are worried that their child will always be difficult. What do you tell them? (see response, page 213)

FIGURE 7.1

Do Babies' Temperaments Change? It is possible—especially if they were fearful babies. Adults who are reassuring help children overcome fearfulness. If fearful children do not change, it is not known whether that's because their parents are not sufficiently reassuring (nurture) or because the babies themselves are temperamentally more fearful (nature).



Source Adapted from Fox et al., 2001.

Other studies confirm that difficult infants often become easier—*if* their parents provide excellent, patient care (Belsky & Pluess, 2009). How could this be? Some scientists suggest that, since fussy and scared children often come to the parents for comfort or reassurance, they are particularly likely to flourish with responsive parenting, but they wither if their parents are rejecting (Stupica et al., 2011). This is differential susceptibility again.

The two patterns evident in all these studies—continuity and improvement—have been replicated in many longitudinal studies of infant temperament, especially for antisocial personality traits. Difficult babies tend to become difficult children, but family and culture sometimes mitigate negative outcomes.

Goodness of Fit

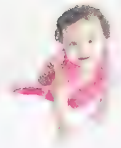
All the research finds that traces of childhood temperament endure, blossoming into adult personality, but all the research also confirms that innate tendencies are only part of the story. Context always shapes behavior. Ideally, parents find a **goodness of fit**—that is, meshing infant temperament and parent personality to allow smooth infant–caregiver interactions. With a good fit, parents of difficult babies build a close and affectionate relationship; parents of exuberant infants learn to protect them from harm; parents of slow-to-warm-up toddlers encourage them while giving them time to adjust.

goodness of fit A similarity of temperament and values that produces a smooth interaction between an individual and his or her social context, including family, school, and community.

However, not only does infant temperament vary, parental temperament varies as well. One study found that parents who claimed goodness of fit between themselves and their infant were likely to be better parents, even when such obvious correlates as education were taken into account (Seifer et al., 2014). Obviously, adults need to adjust to babies more than vice-versa, but even in infancy, a person's temperament affects how people treat him or her.

Childhood temperament is linked to the parents' genes and their personalities, which often are assessed using five dimensions, called the **Big Five**—openness, conscientiousness, extroversion, agreeableness, and neuroticism. Adults who are high in extroversion (surgency), high in agreeableness (effortful control), and low in neuroticism (negative mood) tend to be warmer and more competent parents (de Haan et al., 2009).

Big Five The five basic clusters of personality traits that remain quite stable throughout life: openness, conscientiousness, extroversion, agreeableness, and neuroticism.



SUMMING UP Brain maturation underlies much of emotional development in the first two years. The circumstances of an infant's life affect emotions and sculpt the brain, with long-lasting effects. Early maltreatment can be particularly devastating to later emotional expression, because extreme early fear increases cortisol, which may damage the hippocampus. Some babies are more difficult, which can begin a cascade of hostile relationships or can eventually increase the mutual responsiveness of caregiver and child.

Temperament is inborn, with some babies much easier and others more difficult, some more social and others more shy. Such differences are partly genetic and therefore lifelong, but caregiver responses channel temperament into useful or destructive traits.

WHAT HAVE YOU LEARNED?

1. What is known and unknown about the impact of brain maturation on emotions?
2. How does stress affect early brain development?
3. Why is synesthesia more common in infancy than later on?
4. What happens to traits of temperament as development continues?
5. How do parents and cultures affect temperament?

Response for Nurses (from page 211): It's too soon to tell. Temperament is not truly "fixed" but variable, especially in the first few months. Many "difficult" infants become happy, successful adolescents and adults, if their parents are responsive.

The Development of Social Bonds

As you see, the social context has a powerful impact on development. So does the infant's age, via brain maturation. With regard to emotional development, the age of the baby determines specific social interactions that lead to growth—first synchrony, then attachment, and finally social referencing (see Visualizing Development, p. 216).

Synchrony

Early parent–child interactions are described as **synchrony,** a mutual exchange that requires split-second timing. Metaphors for synchrony are often musical—a waltz, a jazz duet—to emphasize that each partner must be attuned to the other, with moment-by-moment responses. Synchrony is evident in the first three months, becoming more frequent and elaborate as the infant matures (Feldman, 2007).

synchrony A coordinated, rapid, and smooth exchange of responses between a caregiver and an infant.

Both Partners Active

Detailed research reveals the symbiosis of adult–infant partnerships. Adults rarely smile at young infants until the infants smile at them, several weeks after birth. That tentative baby smile is like a switch that turns on the adults, who usually grin broadly and talk animatedly (Lavelli & Fogel, 2005).

Direct observation reveals synchrony; anyone can see it when watching a caregiver play with an infant who is too young to talk. It is also evident in computer measurement of the millisecond timing of smiles, arched eyebrows, and so on (Messinger et al., 2010). Synchrony is a powerful learning experience for the new human. In every interaction, infants read others' emotions and develop social skills, such as taking turns and watching expressions.

Synchrony usually begins with adults imitating infants (not vice versa), with tone and rhythm (Van Puyvelde et al., 2010). Adults respond to barely perceptible infant facial expressions and body motions. This helps infants connect their internal state with behaviors that are understood within their culture. Synchrony





Four Happy People Synchrony lets infants and caregivers communicate crucial messages: "I love you," or "How delightful!," or simply "Let's have fun."

is particularly apparent in Asian cultures, perhaps because of a cultural focus on interpersonal sensitivity (Morelli & Rothbaum, 2007).

In Western cultures as well, parents and infants become partners. This relationship is crucial when the infant is at medical risk. The necessity of time-consuming physical care might overwhelm concern about psychosocial needs, yet those needs are as important for long-term health as are the biological ones (Newnham et al., 2009). Responsiveness to the individual, not simply to the impaired human, leads to a strong, mutual love between parents and child (Solomon, 2012).

Neglected Synchrony

Is synchrony necessary? If no one plays with an infant, what will happen? Experiments involving the **still-face technique** have addressed these questions (Tronick, 1989; Tronick & Weinberg, 1997).

still-face technique An experimental practice in which an adult keeps his or her face unmoving and expressionless in face-to-face interaction with an infant.

In still-face studies, an infant faces an adult who responds normally while two video cameras simultaneously record their interpersonal reactions. Frame-by-frame analysis reveals that parents instinctively synchronize their responses to the infants' movements, with exaggerated tone and expression. Babies reciprocate with smiles and flailing limbs.

To be specific, long before they can reach out and grab, infants respond excitedly to caregiver attention by waving their arms. They are delighted if the adult moves closer so that a waving arm can touch the face or, even better, a hand can grab hair. You read about this eagerness for interaction (when infants try to "make interesting events last") in Chapter 6.

In response, adults open their eyes wide, raise their eyebrows, smack their lips, and emit nonsense sounds. Hair-grabbing might make adults bob their head back and forth, in a playful attempt to shake off the grab, to the infants' delight, or might cause a sudden angry expression, with a loud "No" making the infant burst into tears. Even that is better than no response at all.

In still-face experiments, the adult stops all expression on cue, staring quietly with a "still face" for a minute or two. Sometimes by 2 months, and clearly by 6 months, infants are upset when their parents are unresponsive. Babies frown, fuss, drool, look away, kick, cry, or suck their fingers. By 5 months, they also vocalize, as if to say, "React to me" (Goldstein et al., 2009).

Many studies of still faces and other reactions reach the same conclusion: Babies need synchrony. Responsiveness aids psychosocial and biological development, evident in heart rate, weight gain, and brain maturation. Particularly in the



first year, depressed and anxious mothers are less likely to respond with synchrony to their infants, and then babies become less able to respond to social cues (Atzil et al., 2014).

Attachment

Toward the end of the first year, face-to-face synchrony almost disappears. Once infants can walk, they are no longer content to respond, moment by moment, to adult facial expressions and vocalizations.

Instead **attachment** becomes evident. Actually, attachment is lifelong, beginning before birth and influencing relationships throughout life (see At About This Time). Thousands of researchers on every continent have studied attachment.

attachment According to Ainsworth, "an affectional tie" that an infant forms with a caregiver—a tie that binds them together in space and endures over time.

Researchers were inspired by John Bowlby (1982, 1983) and by Mary Ainsworth, who described mother–infant relationships in central Africa 60 years ago (Ainsworth, 1967). Attachment studies have occurred in every nation, with extensive research on atypical population (e.g., infants with Down syndrom, with autism, and so on) and on adult relationships with other adults and with their own children (Simpson & Rholes, 2015; Grossmann et al., 2014).

Signs of Attachment

Infants show their attachment through *proximity-seeking* (such as approaching and following their caregivers) and through *contact-maintaining* (such as touching, snuggling, and holding). Those attachment expressions are evident when a baby

at about this time

Stages of Attachment

Birth to 6 weeks	*Preattachment.* Newborns signal, via crying and body movements, that they need others. When people respond positively, the newborn is comforted and learns to seek more interaction. Newborns are also primed by brain patterns to recognize familiar voices and faces.
6 weeks to 8 months	*Attachment in the making.* Infants respond preferentially to familiar people by smiling, laughing, babbling. Their caregivers' voices, touch, expressions, and gestures are comforting, often overriding the infant's impulse to cry. Trust (Erikson) develops.
8 months to 2 years	*Classic secure attachment.* Infants greet the primary caregiver, play happily when he or she is present, show separation anxiety when the caregiver leaves. Both infant and caregiver seek to be close to each other (proximity) and frequently look at each other (contact). In many caregiver–infant pairs, physical touch (patting, holding, caressing) is frequent.
2 to 6 years	*Attachment as launching pad.* Young children seek their caregiver's praise and reassurance as their social world expands. Interactive conversations and games (hide-and-seek, object play, reading, pretending) are common. Children expect caregivers to comfort and entertain.
6 to 12 years	*Cultural attachment.* Children seek to make their caregivers proud by learning whatever adults want them to learn, and adults reciprocate. In concrete operational thought (Piaget), specific accomplishments are valued by adults and children. Children develop loyalty to family, community, nation.
12 to 18 years	*New attachment figures.* Teenagers explore and make friendships independent from parents, using their working models of earlier attachments as a base. With formal operational thinking (Piaget), shared ideals and goals become influential.
18 years on	*Attachment reinvented.* Adults develop relationships with others, especially relationships with romantic partners and their own children, influenced by earlier attachment patterns. Past insecure attachments from childhood can be repaired rather than repeated, although this does not always happen.

Source: Adapted from Grobman, 2008.

VISUALIZING DEVELOPMENT

Developing Attachment

Attachment begins at birth and continues lifelong. Much depends not only on the ways in which parents and babies bond, but also on the quality and consistency of caregiving, the safety and security of the home environment, and individual and family experience. While the patterns set in infancy may echo in later life, they are not determinative.

HOW MANY CHILDREN ARE SECURELY ATTACHED?

The specific percentages of children who are secure and insecure vary by culture, parent responsiveness, and specific temperament and needs of both the child and the caregiver. Generally, about a third of all 1-year-olds seem insecure.

50–70%	10–20%	10–20%	5–10%
Securely Attached (Type B)	Avoidant Attachment (Type A)	Ambivalent Attachment (Type C)	Disorganized Attachment (Type D)

ATTACHMENT IN THE STRANGE SITUATION MAY INFLUENCE RELATIONSHIPS THROUGH THE LIFE SPAN

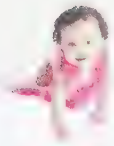
Attachment patterns formed early affect adults lifelong, but later experiences of love and rejection may change early patterns. Researchers measure attachment by examining children's behaviors in the Strange Situation where they are separated from their parent and play in a room with an unfamiliar caregiver. These early patterns can influence later adult relationships. As life goes on, people become more or less secure, avoidant, or disorganized.

Securely Attached [Type B] In the Strange Situation, children are able to separate from caregiver but prefer caregiver to strangers.	Later in life, they tend to have good relationships and good self-esteem.
Avoidant [Type A] In the Strange Situation, children avoid caregiver.	Later in life, they tend to be aloof in personal relationships.
Resistant/Ambivalent [Type C] In the Strange Situation, children appear upset and worried when separated from caregiver; they may hit or cling.	Later in life, their relationships may be angry, stormy, unpredictable.
Disorganized [Type D] In the Strange Situation, children appear angry, confused, erratic, or fearful.	Later in life, they can demonstrate odd behavior—including sudden emotions.

THE CONTINUUM OF ATTACHMENT

Avoidance and anxiety occur along a continuum. Neither genes nor cultural variations were understood when the Strange Situation was first developed (in 1965). Some contemporary reseachers believe the link between childhood attachment and adult personality is less straightforward.





cries if the caregiver closes the door when going to the bathroom or fusses if a back-facing car seat prevents the baby from seeing the parent.

To maintain contact when driving in a car and to reassure the baby, some caregivers in the front seat reach back to give a hand, or install a mirror so they can see the baby and the baby can see them as they drive. Some caregivers take the baby into the bathroom, leading to one's mother's complaint that she hadn't been alone in the bathroom for two years (Senior, 2014). As in this example, maintaining contact need not be physical: Visual or verbal connections are often sufficient.

Caregivers also are attached. They keep a watchful eye on their baby, and they initiate interactions with expressions, gestures, and sounds. Before going to sleep at midnight they might tiptoe to the crib to gaze at their sleeping infant, or, in daytime, absentmindedly smooth their toddler's hair.

Attachment is universal, being part of the inborn social nature of the human species, but specific manifestations depend on the culture as well as the age of the people who are attached to each other. For instance, Ugandan mothers never kiss their infants, but they often massage them, contrary to Westerners, who rarely massage except when they are putting on lotion.

Some American adults remain in contact with each other via daily phone calls, e-mails, or texts and keep in proximity by sitting in the same room as each reads quietly. In other cultures, adults often hold hands, hug, touch each others' faces, shoulders, buttocks. Some scholars believe that attachment to infants, not only from mothers but also fathers, grandparents, and nonrelatives, is the reason that *Homo sapiens* thrived when other species became extinct (Hrdy, 2009).

LaunchPad

Video Activity: Mother Love and the Work of Harry Harlow features classic footage of Harlow's research, showing the setup and results of his famous experiment.

Secure and Insecure Attachment

Attachment is classified into four types: A, B, C, and D (see Table 7.1). Infants with **secure attachment** (type B) feel comfortable and confident. The caregiver is a *base for exploration*, providing assurance and enabling discovery. A toddler might, for example, scramble down from the caregiver's lap to play with an intriguing toy but periodically look back and vocalize (contact-maintaining) or bring the toy to the caregiver for inspection (proximity-seeking).

By contrast, insecure attachment (types A and C) is characterized by fear, anxiety, anger, or indifference. Some insecure children play independently without maintaining contact; this is **insecure-avoidant attachment** (type A). The

secure attachment A relationship in which an infant obtains both comfort and confidence from the presence of his or her caregiver.

insecure-avoidant attachment A pattern of attachment in which an infant avoids connection with the caregiver. The infant seems not to care about the caregiver's presence, departure, or return.

TABLE 7.1 Patterns of Infant Attachment

Type	Name of Pattern	In Play Room	Mother Leaves	Mother Returns	Toddlers in Category (%)
A	Insecure-avoidant	Child plays happily.	Child continues playing.	Child ignores her.	10–20
B	Secure	Child plays happily.	Child pauses, is not as happy.	Child welcomes her, returns to play.	50–70
C	Insecure-resistant/ ambivalent	Child clings, is preoccupied with mother.	Child is unhappy, may stop playing.	Child is angry; may cry, hit mother, cling.	10–20
D	Disorganized	Child is cautious.	Child may stare or yell; looks scared, confused.	Child acts oddly—may scream, hit self, throw things.	5–10

insecure-resistant/ambivalent attachment A pattern of attachment in which an infant's anxiety and uncertainty are evident, as when the infant becomes very upset at separation from the caregiver and both resists and seeks contact on reunion

disorganized attachment A type of attachment that is marked by an infant's inconsistent reactions to the caregiver's departure and return

opposite reaction is **insecure-resistant/ambivalent attachment** (type C). Children with this type of attachment cling to caregiver and are angry at being left.

Ainsworth's original schema differentiated only types A, B, and C. Later researchers discovered a fourth category (type D), **disorganized attachment.** Type D infants may shift suddenly from hitting to kissing their mothers, from staring blankly to crying hysterically, from pinching themselves to freezing in place.

Among the general population, about two-thirds of infants are secure (type B). Their mothers' presence gives them courage to explore; her departure causes distress; her return elicits positive social contact (such as smiling or hugging) and then more playing. The infant's balanced reaction—being concerned but not overwhelmed by comings and goings—indicates security. Early research was only on mothers; later, fathers and other caregivers were included, since they also could have secure or insecure attachments to an infant.

About one-third of infants are insecure, either indifferent (type A) or unduly anxious (type C). About 5 to 10 percent of infants fit into none of these categories; they are disorganized (type D), with no consistent strategy for social interaction, even avoidance or resistance. Sometimes they become hostile and aggressive, difficult for anyone to relate to (Lyons-Ruth et al., 1999). Unlike the first three types, disorganized infants have elevated levels of cortisol in reaction to stress (Bernard & Dozier, 2010).

Measuring Attachment

Ainsworth (1973) developed a now-classic laboratory procedure called the **Strange Situation** to measure attachment. In a well-equipped playroom, an infant is observed for eight episodes, each lasting three minutes. First, the child and mother are together. Next, according to a set sequence, the mother and then a stranger come and go. Infants' responses to their mother indicate which type of attachment they have formed.

Strange Situation A laboratory procedure for measuring attachment by evoking infants' reactions to the stress of various adults' comings and goings in an unfamiliar playroom.

Researchers are trained to distinguish types A, B, C, and D. They focus on the following:

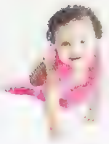
Exploration of the toys. A secure toddler plays happily.
Reaction to the caregiver's departure. A secure toddler notices when the caregiver leaves and shows some sign of missing him or her.
Reaction to the caregiver's return. A secure toddler welcomes the caregiver's reappearance, usually seeking contact, and then plays again.

Excited, Troubled, Comforted This sequence is repeated daily for 1-year-olds, which is why the same sequence is replicated to measure attachment. As you see, toys are no substitute for mother's comfort if the infant or toddler is secure, as this one seems to be. Some, however, cry inconsolably or throw toys angrily when left alone.









Attachment is not always measured via the Strange Situation; surveys and interviews are also used. Sometimes parents answer 90 questions about their children's characteristics, and sometimes adults are interviewed extensively (according to a detailed protocol) about their relationships with their own parents, again with various specific measurements (Fortuna & Roisman, 2008).

Research measuring attachment has revealed that some behaviors that might seem normal are, in fact, a sign of insecurity. For instance, an infant who clings to the caregiver and refuses to explore the toys might be type A. Likewise, adults who say their childhood was happy and their mother was a saint, especially if they provide few specific memories, might be insecure. And young children who are immediately friendly to strangers may never have formed a secure attachment (Tarullo et al., 2011).

Assessments of attachment that were developed and validated for middle-class North Americans may be less useful in other cultures. Infants who seem dismissive or clingy may not necessarily be insecure. Everywhere, however, parents and infants are attached to each other, and everywhere secure attachment predicts academic success and emotional stability (Erdman & Ng, 2010; Otto & Keller, 2014; Drake et al., 2014).

Insecure Attachment and the Social Setting

At first, developmentalists expected secure attachment to "predict all the outcomes reasonably expected from a well-functioning personality" (R. A. Thompson & Raikes, 2003, p. 708). But this expectation turned out to be naive.

Securely attached infants *are* more likely to become secure toddlers, socially competent preschoolers, high-achieving schoolchildren, and capable parents. Attachment affects early brain development, one reason these later outcomes occur (Diamond & Fagundes, 2010). But insecure infants are not doomed to later failure.

Although attachment patterns form in infancy (see Table 7.2), they are not set in stone; they may change when the family context changes, such as new abuse or income loss. Poverty increases the likelihood of insecure attachment, and insecure attachment correlates with later learning problems, but a third variable may be the reason for this correlation. For instance, many aspects of low SES increase the risk of low school achievement, hostile children, fearful adults, all also increased with insecure infant attachment.

The underlying premise—that responsive early parenting leads to secure attachment, which buffers stress and encourages exploration—seems valid. However, attachment behaviors in the Strange Situation provide only one sign of the quality of the parent–child relationship. Linking early attachment and later problems directly may not be warranted (Keller, 2014).

Predictors of Attachment Type

Secure attachment (type B) is more likely if:

- The parent is usually sensitive and responsive to the infant's needs.
- The infant–parent relationship is high in synchrony.
- The infant's temperament is "easy."
- The parents are not stressed about income, other children, or their marriage.
- The parents have a working model of secure attachment to their own parents.

Insecure attachment is more likely if:

- The parent mistreats the child. (Neglect increases type A; abuse increases types C and D.)
- The mother is mentally ill. (Paranoia increases type D; depression increases type C.)
- The parents are highly stressed about income, other children, or their marriage. (Parental stress increases types A and D.)
- The parents are intrusive and controlling. (Parental domination increases type A.)
- The parents actively suffer from alcoholism. (Father with alcoholism increases type A; mother with alcoholism increases type D.)
- The child's temperament is "difficult." (Difficult children tend to be type C.)
- The child's temperament is "slow to warm up." (This correlates with type A.)

Insights from Romania

No scholar doubts that close human relationships should develop in the first

year of life and that the lack of such relationships risks dire consequences. Unfortunately, thousands of children born in Romania are proof.

When Romanian dictator Nicolae Ceausesçu forbade birth control and abortions in the 1980s, illegal abortions became the leading cause of death for Romanian women aged 15 to 45 (Verona, 2003), and more than 100,000 children were abandoned to crowded, impersonal, state-run orphanages. The children experienced severe deprivation, including virtually no normal interaction, play, or conversation.

In the two years after Ceausesçu was ousted and killed in 1989, thousands of those children were adopted by North American, western European, and Australian families. Those who were adopted before 6 months of age fared best; the adoptive parents established synchrony via play and caregiving. Most of the children developed normally.

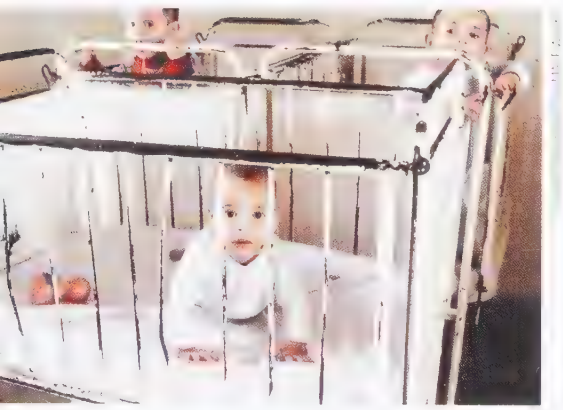
For those adopted after 6 months, and especially after 12 months, early signs were encouraging: Skinny infants gained weight and grew faster than other 1-year-olds, developing motor skills they had lacked (H. Park et al., 2011). However, their early social deprivation soon became evident in their emotions and intellect. Many were overly friendly to strangers throughout childhood, a sign of insecure attachment (Tarullo et al., 2011). At age 11, their average IQ was only 85, 15 points below normal (Rutter et al., 2010).

Even among those who were well nourished, or who caught up to normal growth, many became impulsive, angry teenagers. Apparently, the stresses of adolescence and emerging adulthood have exacerbated the cognitive and social strains on these young people and their families (Merz & McCall, 2011).

These children are now adults, many with serious emotional or conduct problems. The cause is more social than biological. Research on children adopted nationally and internationally finds that many develop into normal adults, but every stress—from rejection in infancy to early institutionalization to the circumstances of the adoption process—makes it more difficult for the infant to become a happy, well-functioning adult (Grotevant & McDermott, 2014).

Romanian infants are no longer available for international adoption, even though some remain abandoned. Research confirms that early emotional deprivation, not genes or nutrition, is their greatest problem. Romanian infants develop best in their own families, second best in foster families, and worst in institutions (Nelson et al., 2007). As best we know, this applies to infants everywhere: Families usually nurture their babies better than strangers who care for many infants at once, and the more years children spend in an impersonal institution, the more likely it is they will become socially and intellectually impaired (Julian, 2013).

Fortunately, in Eastern Europe and elsewhere, institutions have improved or been shuttered; more-recent adoptees are not as impaired as those Romanian orphans (Grotevant & McDermott, 2014). However, some infants in every nation are deprived of healthy interaction, sometimes within their own families. Ideally, no infant is institutionalized, but if that ideal is not reached, institutions need to change so that psychological health is as important as physical health (McCall, 2013). Children need responsive caregivers from early infancy on, biological relatives or not.



Danger Ongoing Look closely and you can see danger. That bent crib bar could strangle an infant, and that chipped paint could contain lead. (Lead tastes sweet; is that why two of the children are biting it?) Fortunately, these three Romanian infants (photographed in 1990) escaped those dangers to be raised in loving adoptive homes. Unfortunately, the damage of social isolation (note the sheet around the crib) could not be completely overcome: Some young adults who spent their first year in an institution like this still carry emotional scars.

Preventing Problems

All infants need love and stimulation; all seek synchrony and then attachment—secure if possible, insecure if not. Without some adult support, infants become disorganized and adrift, emotionally troubled. Extreme early social deprivation is difficult to overcome.

Since synchrony and attachment develop over the first year, and since a third of all parents have difficulty establishing secure attachments, many developmentalists have sought to discover what particularly impairs these parents and what can be done to improve their parenting.

Secure attachment is more difficult to achieve when the parents were abused as children, when families are socially isolated, when mothers are young adolescents, or when infants are unusually difficult (Zeanah et al., 2011). If biological parents do not care for their newborns, foster or adoptive parents need to be found quickly so that synchrony and attachment can develop (McCall, 2013).

Some birth parents, fearing that they cannot provide responsive parenting, choose adoptive parents for their newborns. If high-risk birth parents believe they can provide good care, early support may prevent later problems. Success has been reported when skilled professionals come to the home to nurture relationships between infant and caregiver (Lowell et al., 2011). If a professional helps parents in the first days after birth, perhaps by using the Brazelton Neonatal Behavioral Assessment Scale (mentioned in Chapter 4) to encourage bonding, then problems need never start (e.g., Nugent et al., 2009).

Social Referencing

Social referencing refers to seeking emotional responses or information from other people, much as a student might consult a dictionary or other reference work. Someone's reassuring glance, cautionary words, or a facial expression of alarm, pleasure, or dismay—those are social references.

social referencing Seeking information about how to react to an unfamiliar or ambiguous object or event by observing someone else's expressions and reactions. That other person becomes a social reference.

Even at 8 months, infants notice where other people are looking and use that information to look in the same direction themselves (Tummeltshammer et al., 2014). After age 1, when infants can walk and are "little scientists," their need to consult others becomes urgent as well as more accurate.

Toddlers search for clues in gazes, faces, and body position, paying close attention to emotions and intentions. They focus on their familiar caregivers, but they also use relatives, other children, and even strangers to help them assess objects and events. They are remarkably selective, noticing that some strangers are reliable references and others are not (Fusaro & Harris, 2013).

Social referencing has many practical applications. Consider mealtime. Caregivers the world over smack their lips, pretend to taste, and say "yum-yum," encouraging toddlers to eat their first beets, liver, or spinach. For their part, toddlers become astute at reading expressions, insisting on the foods that the adults *really* like. If mother likes it, and presents it on the spoon, then they eat it—otherwise not (Shutts et al., 2013).

Through this process, some children develop a taste for raw fish or curried goat or smelly cheese—foods that children in other cultures refuse. Similarly, toddlers use social cues to understand the difference between real and pretend eating, as well as to learn which objects, emotions, and activities are forbidden.



Rotini Pasta? Look again. Every family teaches their children to relish delicacies that other people avoid. Examples are bacon (not in Arab nations), hamburgers (not in India), and, as shown here, a witchetty grub. This aboriginal Australian boy is about to swallow an insect larva.

Fathers as Social Partners

Fathers enhance their children's social and emotional development in many ways (Lamb, 2010). Synchrony, attachment, and social referencing are sometimes more apparent with fathers than with mothers. Furthermore, fathers typically elicit more smiles and laughter from their infants than mothers do, probably because they play more exciting games, while mothers do more caregiving and comforting (Fletcher et al., 2013).

Although gender, cultural, and age differences emerge fathers and mothers often work together to raise the children. One researcher reports "mothers and fathers showed patterns of striking similarity: they touched, looked, vocalized, rocked, and kissed their newborns equally" (Parke, 2013, p. 121). Differences are obvious from one couple to another, but not from one gender to another—except for smiling (women do it more).

It is a stereotype that African American, Latin American, and Asian American fathers are less nurturing and more strict than other men (Parke, 2013). Within the United States, the trend toward more father–infant interaction than in previous cohorts is apparent among all ethnic groups, although income and place of residence play a role (Roopnarine & Hossain, 2013; Qin & Chang, 2013).

Close father–infant relationships can teach infants (especially boys) appropriate expressions of emotion, particularly anger. The results may endure: Teenagers are less likely to lash out at friends and authorities if, as infants, they experienced a warm, responsive relationship with their father (Hoeve et al., 2011).



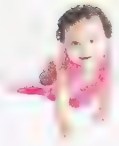
Same Situation, Far Apart: Bonded That fathers enjoy their sons is not surprising, but notice the infants' hands—one clutching Dad's hair tightly and the other reaching for Dad's face. At this age, infants show their trust in adults by grabbing and reaching. Synchrony and attachment are mutual, in Ireland *(left)*, Kenya *(right)*, and in your own neighborhood

Less rigid gender roles seem to be developing in every nation, allowing a greater caregiving role for fathers within every nation (Lamb, 2013). One U.S. example of historical change is the number of married women with children under age 6 who are employed. In 1970, 30 percent of married mothers of young children earned paychecks; in 2012, 60 percent did (U.S. Bureau of Labor Statistics, 2013). These statistics include many mothers of infants, who often rely on the baby's father for child care.

Note the reference to "married" mothers: About half the mothers of infants in the United States are not married, and their employment rates are higher than their married counterparts. Often, the fathers of their infants are active in child care, whether or not they cohabit. As detailed later in this chapter, fathers—not necessarily married—often care for infants when mothers are at work.

Nonetheless, in most cultures and ethnic groups, fathers of every marital status still spend less time with infants than mothers do (Parke, 2013; Tudge, 2008). National cultures and parental attitudes are influential: Some women are gatekeepers, believing that child care is their special domain. They exclude fathers (perhaps indirectly, saying, "You're not holding her right").

When mothers engage the fathers in child care, they must not imply that he cannot do it properly. For example, she may lay out the clothes the baby is to wear, as if he could not find clothes (Pedersen & Kilzer, 2014). Both parents, ideally, are infant caregivers.



One male/female difference seems to persist: When asked to play with their baby, mothers typically caress, read, sing, or play traditional games such as peek-a-boo. Fathers are more exciting: They move their infant's limbs in imitation of walking, kicking, or climbing, or they swing the baby through the air, sideways, or even upside down. Mothers might say, "Don't drop him"; fathers and babies laugh with joy. In this way, fathers tend to help children become less fearful.

Over the past 20 years, father–infant research has tried to answer three questions:

1. Can men provide the same care as women?
2. Is father–infant interaction different from mother–infant interaction?
3. How do fathers and mothers cooperate to provide infant care?

Many studies over the past two decades have answered yes to the first two questions. A baby fed, bathed, and diapered by Dad is just as happy and clean as when Mom does it. Gender differences are sometimes found in specifics, but they are not harmful.

On the third question, the answer depends on the family (Bretherton, 2010). Usually, mothers are caregivers and fathers are playmates, but not always. Each couple, given their circumstances (which might include being immigrant, low-income, or same-sex), finds their own way to complement each other to help their infant thrive (Lamb, 2010). Traditional mother–father roles may be switched, with no harm to the baby (Parke, 2013).

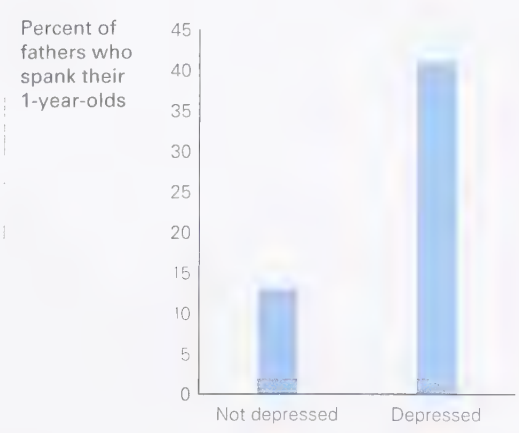
A constructive *parental alliance* can take many forms, but it cannot be taken for granted, no matter what the family configuration. Single-parent families, or grandparent families, are not necessarily better or worse than nuclear families. (**Developmental Link:** Family forms are discussed in Chapter 13.)

Sometimes no one is happy with the infant, and then the baby suffers. Father care can be quite wonderful, but it is not always so. One study reported that 7 percent of fathers of 1-year-olds were depressed, and they were four times as likely to spank as were nondepressed fathers (40 percent versus 10 percent) (Davis et al., 2011) (see Figure 7.2). (**Developmental Link:** Punishment is discussed in Chapter 10.)

Family members affect each other. Paternal depression correlates with maternal depression and with sad, angry, disobedient toddlers. Cause and consequence are intertwined. When anyone is depressed or hostile, everyone (mother, father, baby, sibling) needs help.

FIGURE 7.2

Shame on Who? Not on the toddlers, who are naturally curious and careless, but maybe not on the fathers, either. Both depression and spanking are affected by financial stress, marital conflict, and cultural norms; who is responsible for those?



Source: Davis et al., 2011

SUMMING UP Caregivers and young infants engage in split-second interaction, which is evidence of synchrony. Still-face research has found that infants depend on such responsiveness and try to elicit it. Attachment between people is universal; it is apparent in infancy with contact-maintaining and proximity-seeking behaviors as 1-year-olds explore their world. Such early patterns may persist, affecting how adults respond to their own infants. Without responsive caregivers, as happened to some institutionalized Romanian infants, the child may be impaired socially lifelong.

Toddlers use other people as social references to guide them in their exploration. Fathers are as capable as mothers in social partnerships with infants, although they may favor physical, creative play more than mothers do. Every family member affects all the others; ideally, they cooperate to create a caregivers' alliance to support the baby's development.

WHAT HAVE YOU LEARNED?

1. How might synchrony affect early emotional development?
2. How might an infant demonstrate proximity-seeking and contact-maintaining attachment?
3. How might each of the four types of attachment be expressed in adulthood?
4. What has been learned from the research on Romanian infants?
5. How is social referencing important in toddlerhood?
6. How do fathers contribute to infant development?

LaunchPad



SWEET NOVEMBER STUDIO/SHUTTERSTOCK

Video: Theories of Emotional Development in Infancy and Toddlerhood summarizes the theories of personality development described in this section.

Theories of Infant Psychosocial Development

Consider again the theories discussed in Chapter 2. As you will see, theories lead to insight and applications that are relevant for the final topic of this chapter, infant day care.

You will notice that the two universal theories, humanism and evolution, are discussed separately. That is because the implications of each for infants diverge, and thus they should not be lumped together.

You will also see that sociocultural theory is *not* described as a separate theory. From that omission do not conclude that it is irrelevant—quite the opposite. In every topic of this chapter, cultural differences are highlighted: A sociocultural approach is needed throughout the study of infant psychosocial development. Thus a separate section devoted to it would seem peculiar.

Psychoanalytic Theory

Psychoanalytic theory connects biosocial and psychosocial development. Sigmund Freud and Erik Erikson each described two distinct stages of early development, one in the first year and one beginning in the second.

Freud: Oral and Anal Stages

Especially for Nursing Mothers You have heard that if you wean your child too early he or she will overeat or develop alcoholism. Is it true? (see response, page 227)

According to Freud (1935/1989, 2001), the first year of life is the *oral stage*, so named because the mouth is the young infant's primary source of gratification. In the second year, with the *anal stage*, pleasure comes from the anus—particularly from the sensual satisfaction of bowel movements and, eventually, the psychological pleasure of controlling them.

Freud believed that the oral and anal stages are fraught with potential conflicts. If a mother frustrates her infant's urge to suck—weaning too early or too late, for example, or preventing the baby from sucking a thumb or a pacifier—that may

later lead to an *oral fixation*. A person with an oral fixation is stuck (fixated) at the oral stage, and therefore, as an adult, he or she eats, drinks, chews, bites, or talks excessively, still seeking the mouth-related pleasures of infancy.

Similarly, if toilet training is overly strict or if it begins before the infant is mature enough, then the toddler's refusal—or inability—to comply will clash with the wishes of the adult, who denies the infant normal anal pleasures. That may lead to an anal personality—an adult who seeks self-control, with an unusually strong need for regularity and cleanliness in all aspects of life. (**Developmental Link:** Theory of toilet training is discussed in Chapter 2.)

Erikson: Trust and Autonomy

According to Erikson, the first crisis of life is **trust versus mistrust,** when infants learn whether or not the world can be trusted to satisfy basic needs. Babies feel secure when food and comfort are provided with "consistency, continuity, and sameness of experience" (Erikson, 1963, p. 247). If social interaction inspires trust, the child (later the adult) confidently explores the social world.

The second crisis is **autonomy versus shame and doubt,** beginning at about 18 months, when self-awareness emerges. Toddlers want autonomy (self-rule) over their own actions and bodies. Without it, they feel ashamed and doubtful. Like Freud, Erikson believed that problems in early infancy could last a lifetime, creating adults who are suspicious and pessimistic (mistrusting) or easily shamed (lacking autonomy).

Erikson was aware of cultural variations. He knew that mistrust and shame could be destructive or not, depending on local norms and expectations. Westerners expect toddlers to go through the stubborn and defiant "terrible twos"; that is a sign of the urge for autonomy. Parents in some other places expect toddlers to be more responsive to parent demands, using shame to control misbehavior.

A study of children in three nations found that the Japanese were highest in shame, the Koreans highest in guilt, and the U.S. children highest in pride (Furukawa et al., 2012). As a result, U.S. children are less fearful and less obedient.



REUTERS/JOSE MIGUEL GOMEZ/LANDOV

All Together Now Toddlers in an employees' day-care program at a flower farm in Colombia learn to use the potty on a schedule. Will this experience lead to later personality problems? Probably not.

trust versus mistrust Erikson's first crisis of psychosocial development. Infants learn basic trust if the world is a secure place where their basic needs (for food, comfort, attention, and so on) are met.

autonomy versus shame and doubt Erikson's second crisis of psychosocial development. Toddlers either succeed or fail in gaining a sense of self-rule over their actions and their bodies.

social learning The acquisition of behavior patterns by observing the behavior of others.

Behaviorism

From the perspective of behaviorism, emotions and personality are molded as parents reinforce or punish a child. Behaviorists believe that parents who respond joyously to every glimmer of a grin will have children with a sunny disposition. The opposite is also true:

> Failure to bring up a happy child, a well-adjusted child—assuming bodily health—falls squarely upon the parents' shoulders. [By the time the child is 3] parents have already determined . . . [whether the child] is to grow into a happy person, wholesome and good-natured, whether he is to be a whining, complaining neurotic, an anger-driven, vindictive, over-bearing slave driver, or one whose every move in life is definitely controlled by fear.
>
> *[Watson, 1928, pp. 7, 45]*

Later behaviorists recognized that infant behavior also has an element of **social learning,** as infants learn from other people. You already saw an example, social referencing. Social learning occurs throughout life (Morris et al., 2007; Rendell et al., 2011). Toddlers express emotions in various ways—from giggling to cursing—just as their parents or older siblings do.

For example, a boy might develop a hot temper if his father's outbursts seem to win his mother's respect; a girl might be coy, or passive-aggressive, if that is what she has seen at home. These examples are deliberately sexist: Gender roles, in particular, are learned, according to social learning.

Only in America Toddlers in every nation of the world sometimes cry when emotions overwhelm them, but in the United States young children are encouraged to express emotions and Halloween is a national custom, unlike in other nations. Candy, dress-up, ghosts, witches, and ringing doorbells after sunset—no wonder many young children are overwhelmed.



THINKSTOCK/GETTY IMAGES

Parents often unwittingly encourage certain traits in their children. This is evident in the effects of proximal versus distal parenting. Should parents carry infants most of the time, or will that spoil them? Should babies have many toys, or will that make them too materialistic?

Answers to these questions refer to the distinction between **proximal parenting** (being physically close to a baby, often holding and touching) and **distal parenting** (keeping some distance—providing toys, encouraging self-feeding, talking face-to-face instead of communicating by touch). Caregivers tend to behave in proximal or distal ways very early, when infants are only 2 months old (Kärtner et al., 2010).

proximal parenting Caregiving practices that involve being physically close to the baby, with frequent holding and touching.

distal parenting Caregiving practices that involve remaining distant from the baby, providing toys, food, and face-to-face communication with minimal holding and touching.

Variations in proximal and distal parenting lead to variations in toddler behavior. For instance, toddlers who, as infants, were often held, patted, and hushed (proximal) become toddlers who are more obedient to their parents but less likely to recognize themselves in a mirror (Keller et al., 2010; Keller et al., 2004). Cultural differences in personality are apparent when researchers compared the Nso people of Cameroon (very proximal) with the Greeks in Athens (very distal). Further research in other nations confirms that caregiving styles affect later behavior (Borke et al., 2007; Kärtner et al., 2011).

Should you pick up your crying baby (proximal) or give her a pacifier (distal)? Should you breast-feed until age 2 or longer (proximal) or switch to bottle-feeding before 6 months (distal)? Of course, many factors influence parental actions, and breast-feeding is only one example of parental behavior. But every parental response is influenced by whatever assumptions the culture holds. According to behaviorism, each action reinforces a lesson that the baby learns, in this case about people and objects.

Especially for Pediatricians A mother complains that her toddler refuses to stay in the car seat, spits out disliked foods, and almost never does what she says. How should you respond? (see response, page 228)

Cognitive Theory

Cognitive theory holds that thoughts determine a person's perspective. Early experiences are important because beliefs, perceptions, and memories make them so, not because they are buried in the unconscious (psychoanalytic theory) or burned into the brain's patterns (behaviorism).

working model In cognitive theory, a set of assumptions that the individual uses to organize perceptions and experiences. For example, a person might assume that other people are trustworthy and be surprised by an incident in which this working model of human behavior is erroneous.

According to many cognitive theorists, early experiences help infants develop a **working model,** which is a set of assumptions that becomes a frame of reference for later life (Johnson et al., 2010). It is a "model" because early relationships form a prototype, or blueprint; it is "working" because it is a work in progress, not fixed or final.

Ideally, infants develop "a working model of the self as lovable, and competent" because the parents are "emotionally available, loving, and supportive of mastery efforts" (Harter and Bukowski, 2012, p. 12). However, reality does not always conform to this ideal. A 1-year-old girl might develop a model, based on her parents' inconsistent responses to her, that people are unpredictable. She will continue to apply that model to everyone: Her childhood friendships will be insecure, and her adult relationships will be guarded.

The Best Baby Transport Stroller or sling, carriage or carrier, leave babies at home or bring them to work? Such decisions are strongly influenced by culture, with long-lasting implications. Mothers compare particular brands and designs of strollers, trying to decide on the best one, but it rarely occurs to them that taking the baby outside is, itself, a major decision



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The crucial idea, according to cognitive theory, is that an infant's early experiences themselves are not necessarily pivotal, but the interpretation of those experiences is (Olson & Dweck, 2009). Children may misinterpret their experiences, or parents may offer inaccurate explanations, and these form ideas that affect later thinking and behavior.

In this way, working models formed in childhood echo lifelong. A hopeful message from cognitive theory is that



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SERGEI SUPINSKY/AFP/GETTY IMAGES

Hush Babies cry and parents soothe them the world over, while contexts shape both crying and soothing. The little girl (*left*) will probably quiet soon, as she is held snuggly next to her father's body. The boy (*right*) is less likely to settle down, as he is surrounded by strangers in a Ukrainian contest to see which baby can crawl fastest. What level is this on Maslow's hierachy?

people can rethink and reorganize their thoughts, developing new models. Our mistrustful girl might marry a faithful and loving man and gradually develop a new working model. The form of psychotherapy that seems most successful at the moment is called cognitive-behavioral, in which new thoughts about how to behave are developed. In other words, a new working model is developed.

Response for Nursing Mothers (from page 224): Freud thought so, but there is no experimental evidence that weaning, even when ill-timed, has such dire long-term effects.

Humanism

Remember from Chapter 2 that Maslow described a hierarchy of needs (physiological, safety/security, love/belonging, success/esteem, and self-actualization), with the lower levels being prerequisites for higher ones. Infants begin at the first level: Their emotions serve to ensure that physiological needs are met. That's why babies cry when they are hungry or hurt, as adults usually do not. Basic survival needs must be satisfied to enable the person to reach higher levels (Silton et al., 2011).

Humanism reminds us that caregivers also have needs and that their needs influence how they respond to infants. Self-actualized people (level 5) no longer demand their children's love and respect, so they can guide an infant well even if the child is momentarily angry (as when getting the child immunized). But most young parents are at level 3 or 4, seeking love or respect. They may be troubled by "ghosts in the nursery" (first mentioned in Chapter 5 in the discussion of infant sleep). Their own babyhood experience includes unmet needs, and their early distress interferes with their ability to nurture the next generation.

For example, while all experts endorse breast-feeding as the best way to meet infants' physiological needs, many mothers quit breast-feeding after trying for a few days, and many fathers feel excluded if the mother spends most of her time and attention on nursing. This may puzzle some experts but not the humanist theorists, who realize that a parent's needs may clash with an infant's needs (Mulder & Johnson, 2010).

For example, one mother of a 1-year-old said:

> My son couldn't latch so I was pumping and my breasts were massive and I'm a pretty small woman with big breasts and they were enormous during pregnancy. It has always been a sore spot for me and I've never loved my breasts. And that has been hard for me in not feeling good about myself. And I stopped pumping in January and slowly they are going back and I'm beginning to feel some confidence again and that definitely helps. Because I felt overweight, your boobs are not your own and you are exhausted and your body is strange it's just really hard to want to share that with someone. They think you are beautiful, they love it and love you the way you are but it is not necessarily what you feel.
>
> *[quoted in Shapiro, 2011, p. 18]*

Response for Pediatricians (from page 226): Consider the origins of the misbehavior—probably a combination of the child's inborn temperament and the mother's distal parenting. Acceptance and consistent responses (e.g., avoiding disliked foods but always using the car seat) is more warranted than anger. Perhaps this mother is expressing hostility toward the child—a sign that intervention may be needed. Find out.

This woman's need for self-respect was overwhelming, causing her to stop breast-feeding in order to feel some confidence about her shape. Neither her husband's love of her body nor her son's need for breast milk helped because she was not past level 3 (love and belonging). Her "strange" body attacked her self-esteem (level 4).

Her personal needs may have been unmet since puberty (she says, "I've never loved my breasts"). She blames her husband for not understanding her feelings and her son who "couldn't latch." Since all babies learn to latch with time and help, this woman's saying that her son couldn't latch suggests something amiss in synchrony and attachment—unmet baby needs because of unmet mother needs.

By contrast, some parents understand their baby's need for safety and security (level 2) even if they themselves are far beyond that stage. Kevin is an example.

> Kevin is a very active, outgoing person who loves to try new things. Today he takes his 11-month-old daughter, Tyra, to the park for the first time. Tyra is playing alone in the sandbox, when a group of toddlers joins her. At first, Tyra smiles and eagerly watches them play. But as the toddlers become more active and noisy, Tyra's smiles turn quickly to tears. She . . . reaches for Kevin, who picks her up and comforts her. But then Kevin goes a step further. After Tyra calms down, Kevin gently encourages her to play near the other children. He sits at her side, talking and playing with her. Soon Tyra is slowly creeping closer to the group of toddlers, curiously watching their moves.
>
> *Lerner & Dombro, 2004, p. 42*

Evolutionary Theory

Remember that evolutionary theory stresses two needs: survival and reproduction. Human brains are extraordinarily adept at those tasks. However, not until about two decades of maturation is the human brain fully functioning. A child must be nourished, protected, and taught much longer than offspring of any other species. Infant and parent emotions ensure this lengthy protection (Hrdy, 2009).

Emotions for Survival

Infant emotions are part of this evolutionary mandate. All the reactions described in the first part of this chapter—from the hunger cry to the temper tantrum—can be seen from this perspective (Konner, 2010).

For example, newborns are extraordinarily dependent, unable to walk or talk or even sit up and feed themselves for months after birth. They must attract adult devotion—and they do. That first smile, the sound of infant laughter, and their role in synchrony are all powerfully attractive to adults—especially to parents.

Adults call their hairless, chinless, round-faced, small-limbed creatures "cute," "handsome," "beautiful," "adorable," and willingly devote hours to carrying, feeding, changing, and cleaning them. Adaptation is evident: Mothers and fathers have the genetic potential to be caregivers, and grandparents have done it before, but, according to evolutionary psychology, whether or not that potential is expressed, turning busy adults into devoted caregivers, depends on the particular survival needs of infants in that community.

If humans were motivated merely by financial reward, no one would have children. Yet evolution has created adults who find parenting worth every sacrifice. The costs are substantial: Food (even breast milk requires the mother to eat more), diapers, clothes, furniture, medical bills, toys, and child care (whether paid or unpaid) are just a start.

Before a child becomes independent, many parents have bought a bigger residence, and spent thousands on education, vacations, and much more. These are





Same Behavior, Different Meaning
In both cases, grandmothers were sometimes crucial for child survival. Now, even though medical care has reduced child mortality, grandmothers still do their best to keep children safe. Compare these two—from the eastern United States (left) and western China (right).

only the financial costs, the emotional costs are greater. A recent book about parenting titled *Why Love Matters* highlights the paradox: People choose to sacrifice time, money, and freedom—then find parenting deeply satisfying (Sroufe, 2014).

Indeed, universal readiness to respond to years of self-centered, demanding humans has evolved to prevail. Hormones—genetically, oxytocin—do more than trigger birth and maternal responding; they increase the motivation to bond with others, especially children (Feldman et al., 2011). Brain scans and saliva tests reveal that the sound and sight of infants are designed to be produced as a reward for caregiving. For fathers, oxytocin increases and testosterone decreases after close contact with their infants, a biological signal of parental need (Weisman et al., 2014).

Evolutionary theory holds that over human history, attachment, with proximity-seeking and contact-maintaining, promoted species survival by keeping toddlers near caregivers and keeping caregivers vigilant. Infants fuss at still faces, they express fear of separation, and they laugh when adults play with them, all of which sustain parent–child interdependence. We inherited these emotional reactions from our great-great-grandparents, who would have died without them.

As explained in Chapter 4, human bonding is unlike that of goats and sheep—a mother does not need to nuzzle her newborn immediately. Bonding, followed by synchrony and then attachment, is enhanced by experiences at birth, but the caregiver–infant relationship is strengthened in many other ways. Social connections are stronger and more flexible for humans than for other animals. Toddlers attend to adult expressions (social referencing) as one more way to establish the bond between themselves and others.

Allocare

Evolutionary social scientists note that if mothers were exclusive caregivers of each child until adulthood, a given woman could raise only two offspring—not enough for the species to survive. Instead, before the invention of reliable birth control, the average interval between births for humans was two to four years.

Human birth children at relatively short intervals and raise them successfully because of **allocare**—the care of children by people other than the biological parents (Hrdy, 2009). Allocare is essential for *Homo sapiens* survival.

Compared with many other species (for instance, mother chimpanzees spend 20 hours a day with their babies), human mothers have evolved to let other people help with child care, and other people are usually eager to do so (Kachel et al., 2011). Throughout the centuries, the particular person to provide allocare has varied by culture and ecological conditions.

allocare Literally, "other-care": the care of children by people other than the biological parents.

Often fathers helped but not always: Some men were far away, fighting, hunting, or seeking work, while some had several wives and a dozen or more children. In those situations, other women (daughters, grandmothers, sisters, friends) and sometimes other men provided allocare (Hrdy, 2009).

SUMMING UP All theories recognize that infant care is crucial: Psychosocial development depends on it. Psychoanalytic theory stresses the effects of early caregiving routines—with Freud stressing the lifelong impact of the oral and anal stages and Erikson focusing on the development of trust and autonomy. Behaviorists emphasize early learning, with parents reinforcing or punishing infant reactions. Cognitive theories emphasize working models. In all these theories, lifelong patterns are said to begin in infancy, but later change is possible. Culture is crucial.

Humanists consider the basic needs of adults as well as infants. Consequently, they acknowledge the parental side of the parent–infant interaction. According to evolutionary theory, inborn impulses provide the interdependence that humans have always needed. Since human brains and thoughts take many years to mature, allocare has been essential for the survival of the species. All adults—especially fathers and grandmothers—are primed to care for infants, but the particular survival and reproductive needs of the community determine whether or not they do so.

WHAT HAVE YOU LEARNED?

1. According to Freud, what might happen if a baby's oral needs are not met?
2. How might Erikson's crisis of "trust versus mistrust" affect later life?
3. What cultural differences are apparent in Erikson's crisis of "autonomy versus shame and doubt"?
4. How do behaviorists explain the development of emotions and personality?
5. What does a "working model" mean within cognitive theory?
6. According to humanism, how might caregivers' own needs affect their response to an infant?
7. How does evolution explain the parent–child bond?
8. Why is allocare necessary for survival of the human species?

Infant Day Care

Cultural variations in allocare are vast. Each theory just described can be used to justify or criticize variations. No theory directly endorses any particular position. Nonetheless, theories are made to be useful, so we include some implications of various theories in our discussion.

Many Choices

It is estimated that about 134 million babies will be born each year from 2010 to 2021 (United Nations, 2013). Most newborns are cared for primarily or exclusively by their mothers; allocare increases as the baby gets older. Fathers and grandmothers typically provide care as well. Daily care by a non-relative, trained and paid to provide it, occurs for only about 15 percent of infants worldwide, a statistic that obscures the vast range from one culture to another.

For instance, virtually no infant in some of the poorest nations receives regular non-maternal care unless the mother is dead, and then a close relative takes over. By contrast, 90 percent of the infants of the wealthiest families within some developed nations are cared for regularly by a nanny or babysitter at home, a family day-care provider in her (almost never his) home, or a trained professional in a day-care center, where there are separate rooms for infants, toddlers, and so on.





Same Situation, Far Apart: Instead of Mothers Casper, Wyoming *(left)*, is on the opposite side of the Earth from Dhaka, Bangladesh *(right)*, but day care is needed in both places, as shown here.

OBSERVATION QUIZ What three cultural differences do you see in the pictures above? (see answer, page 233)

As discussed previously, fathers worldwide increasingly take part in baby care. However, some cultures still expect fathers to stay at a distance and others favor equality (Lamb, 2013).

Most nations provide some paid leave for mothers who are in the workforce. Some also provide paid leave for fathers, and several nations provide paid family leave that can be taken by either parent or shared between them. The length of paid leave varies from a few days to about 15 months (see Figure 7.3). Laws in many nations guarantee that a mother's job will be open to her when her leave is over.

Some concern about job security and shared care arises from humanism, which values the well-being of every family member. As found by a group of family physicians, mothers are more likely to become depressed if they are sole caregivers without employment or outside support (Gjerdingen et al., 2014).

Since behaviorists emphasize learning, they seek to ensure that every baby has the proper experiences, whether provided by the mother or by someone else. One popular effort to ensure this is to send trained visitors to mothers of infants at home. They provide toys, books, and advice, encouraging caregiver–infant relationships—a practice that reduces child abuse and other physical and psychological problems (Olds, 2006).

Uncertainty About What is Best

There is no agreed-on best practice. As one review explained: "This evidence now indicates that early nonparental care environments sometimes pose risks to young children and sometimes confer benefits" (Phillips et al., 2011). The same can be said for parents: Some provide excellent care; some do not.

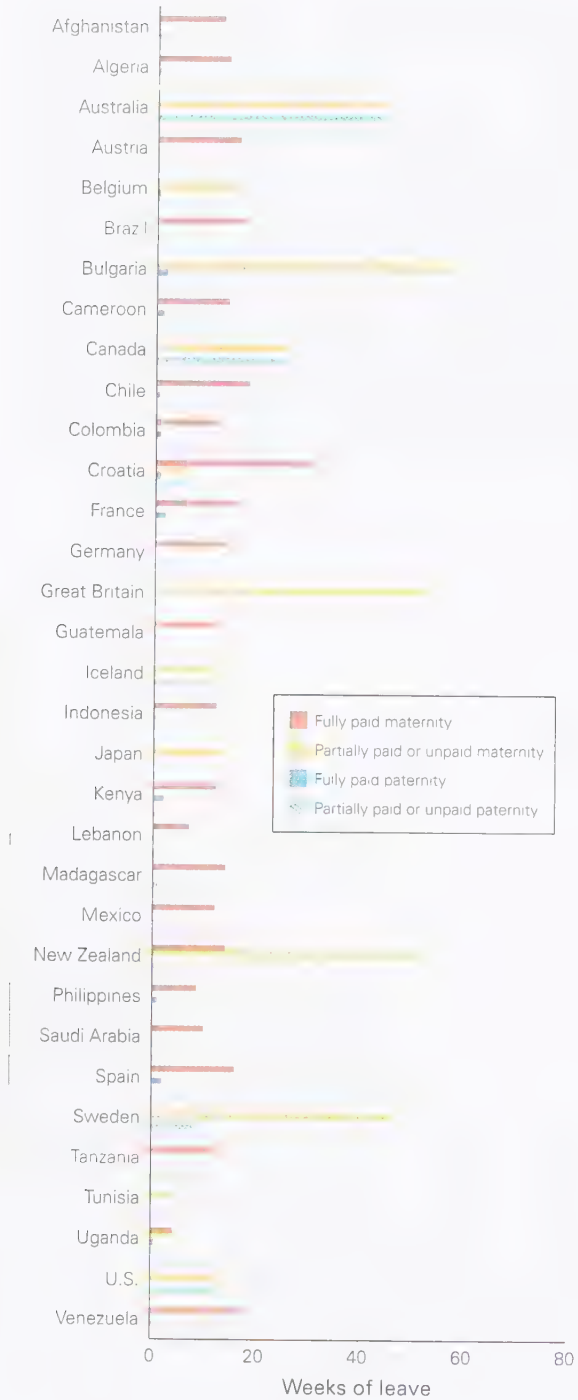
Many people believe that the practices of their own family or culture are best and that other patterns harm either the infant or the mother. This is another example of the difference-equals-deficit error. Without evidence, assumptions flourish. Some people advocate professional care for children of all ages; others disagree. For ideological as well a economic reasons, center-based infant care is common in France, Israel, China, Norway, and Sweden, where it is heavily subsidized by the governments and many families take it for granted as a valuable public right.

Center care is scarce in South Asia, Africa, and Latin America. Many parents believe it is harmful. (Table 7.3 lists five essential characteristics of high-quality infant day care, wherever it may be located.)

TABLE 7.3 High-Quality Day Care

High-quality day care during infancy has five essential characteristics:

1. *Adequate attention to each infant.* A small group of infants (no more than five) needs two reliable, familiar, loving caregivers. Continuity of care is crucial.
2. *Encouragement of language and sensorimotor development.* Infants need language—songs, conversations, and positive talk—and easily manipulated toys.
3. *Attention to health and safety.* Cleanliness routines (e.g., handwashing), accident prevention (e.g., no small objects), and safe areas to explore are essential.
4. *Professional caregivers.* Caregivers should have experience and degrees/certificates in early-childhood education. Turnover should be low, morale high, and enthusiasm evident
5. *Warm and responsive caregivers.* Providers should engage the children in active play and guide them in problem solving. Quiet, obedient children may indicate unresponsive care



Source: ILO Database on Conditions of Work and Employment Laws, 2011.

Note: In some cases, leave can be shared between parents or other family members. Many nations have increased leave in the past three years.

FIGURE 7.3

A Changing World No one was offered maternity leave a century ago because the only jobs that mothers had were unregulated. Now, virtually every nation has a maternity leave policy, revised every decade or so. As of 2012, only Australia, Iceland, and Canada offered policies reflecting gender equality. That may be the next innovation in many nations.

Especially for Day-Care Providers A mother who brings her child to you for day care says that she knows she is harming her baby, but economic necessity compels her to work. What do you say? (see response, page 234)

Most nations are between those two extremes. One example comes from Australia, where the government has recently attempted to increase the birth rate. Parents are given $5,000 for each newborn, parental leave is paid, and public subsidies provide child-care centers. The law endorses the concept that young children benefit from interactions with other children, yet many Australians contend that babies need exclusive maternal care (Harrison et al., 2014). As you might imagine, each side claims support from psychological theory: sociocultural versus Freud.

Parents are caught in the middle. For example, one Australian mother of a 12-month-old boy chose center care, but said:

> I spend a lot of time talking with them about his day and what he's been doing and how he's feeling and they just seem to have time to do that, to make the effort to communicate. Yeah they've really bonded with him and he's got close to them. But I still don't like leaving him there. And he doesn't, to be honest. . . . Because he's used to sort of having, you know, parents.
>
> *[quoted in Boyd et al., 2013]*

Underlying every policy and practice are theories about what is best. In the United States, marked variations are apparent by state and by employer, with some employers far more generous than the law requires. Almost no company pays for paternal leave, with one exception: The U.S. military allows 10 days of paid leave for fathers.

In the United States, only 20 percent of infants are cared for *exclusively* by their mothers (i.e., no other relatives or babysitters) throughout their first year. This is in contrast to Canada, which is similar to the United States in ethnic diversity but has far more generous maternal leave and lower rates of maternal employment. In the first year of life, most Canadians are cared for only by their mothers (Babchishin et al., 2013). Obviously, these differences are affected by culture, economics, and politics more than by any universal needs of babies.

The home visiting programs that help some novice mothers do not always have the desired effects (Paulsell et al., 2014), and grandmother care, informal care, and center care have each sometimes been destructive. For example, in most nations and centuries, infants were more likely to survive if their grandmothers were nearby, especially when they were newly weaned (Sear & Mace, 2008). The hypothesis is that grandmothers provided essential nourishment and protection. But in one era (northern Germany, 1720–1874), living with a grandmother, especially a paternal grandmother, had a negative effect on infant survival (Beise & Voland, 2002).

Mixed evidence can also be found for center care, as the following A View from Science explains.



a view from science

The Mixed Realities of Center Day Care

A professional organization, the National Association for the Education of Young Children, recently revised its standards for care of babies from birth to 15 months, based on current research (NAEYC, 2014). Breast-feeding is encouraged (via bottles of breast milk that mothers have expressed earlier), babies are always put to sleep on their backs, group size is small (no more than eight infants), and the ratio of adults to babies is 1:4 or fewer.

Many specific practices are recommended to keep infant minds growing and bodies healthy. For instance, "before walking on surfaces that infants use specifically for play, adults and children remove, replace, or cover with clean foot coverings any shoes they have worn outside that play area. If children or staff are barefoot in such areas, their feet are visibly clean." Another recommendation is to "engage infants in frequent face-to-face social interactions"—including talking, singing, smiling, touching (NAEYC, 2014).

Such responsive care, unfortunately, has not been routine for infants, especially those not cared for by their mothers. A large study in Canada (Côté et al., 2008) found that infant girls seemed to develop equally well in various care arrangements. However, boys from high-income families with allocare fared less well than similar boys whose mothers provided all their care. By age 4, those who had been in day care were slightly more assertive or aggressive, with more emotional problems (e.g., a teacher might note that a kindergarten boy "seems unhappy").

The opposite was true for boys from low-income families: On average, they benefited from nonmaternal care, again according to teacher reports. The researchers insist that no policy implications can be derived from this study, partly because care varied so much in quality, location, and provider (Côté et al., 2008).

Research in the United States has also found that center care benefits infants of low-income families (Peng & Robins, 2010). For less impoverished children, questions arise. An ongoing longitudinal study by the Early Child Care Network of the National Institute of Child Health and Human Development (NICHD) has followed the development of more than 1,300 children from birth to age 11. Early day care correlated with many cognitive advances, especially in language.

The social consequences were less stellar, however. Most analyses find that secure attachment to the mother was as common among infants in center care as among infants cared for at home. Like other, smaller studies, the NICHD research confirms that the mother–child relationship is pivotal.

However, infant day care seemed detrimental when the mother was insensitive *and* the infant spent more than 20 hours a week in a poor-quality program with too many children (McCartney et al., 2010). Again, boys in such circumstances had more conflicts with their teachers than did the girls or other boys with a different mix of maternal traits and day-care experiences.

More recent work finds that high quality care in infancy benefits the cognitive skills of children of both sexes and all income groups, with no evidences of emotional harm, especially when it is followed by good preschool care (Li et al., 2013). This raises another question: Might changing attitudes and female employment, and centers that reflect new research on infant development (as expressed in the NAEYC standards above) produce more positive results from center care? Or is there something about the connection between mother and baby that evolved over the millennia, as evolutionary theory might posit, that makes mother care better for infants than allocare?

A Stable, Familiar Pattern

No matter what form of care is chosen or what theory is endorsed, individualized care with stable caregivers seems best (Morrissey, 2009). Caregiver change is especially problematic for infants because each simple gesture or sound that a baby makes not only merits an encouraging response but also requires interpretation by someone who knows that particular baby well.

For example, "baba" could mean bottle, baby, blanket, banana, or some other word that does not even begin with *b*. This example is an easy one, but similar communication efforts—requiring individualized emotional responses, preferably from a familiar caregiver—are evident even in the first smiles and cries.

A related issue is the diversity of baby care providers. Especially when the home language is not the majority language, parents hesitate to let people of another linguistic background care for their infants. That is one reason that, in the United

ANSWER TO OBSERVATION QUIZ (from page 231): The Bangladeshi children are dressed alike, are the same age, and are all seated around toy balls in a net—there's not a book in sight, unlike in the Wyoming setting

Response for Day-Care Providers (from page 232): Reassure the mother that you will keep her baby safe and will help to develop the baby's mind and social skills by fostering synchrony and attachment. Also tell her that the quality of mother–infant interaction at home is more important than anything else for psychosocial development; mothers who are employed full time usually have wonderful, secure relationships with their infants. If the mother wishes, you can discuss ways to be a responsive mother.

States, immigrant parents often prefer care by relatives instead of by professionals (Miller et al., 2014). Relationships are crucial, not only between caregiver and infant, but also between caregiver and parent (Elicker et al., 2014).

Particularly problematic is instability of non-maternal care, as when an infant is cared for by a neighbor, a grandmother, a center, and then another grandmother, each for only a month or two. By age 3, children with unstable care histories are likely to be more aggressive than those with stable non-maternal care, such as being at the same center with the same caregiver for years (Pilarz & Hill, 2014).

As is true of many topics in child development, questions remain. But one fact is without question: Each infant needs personal responsiveness. Someone should serve as a partner in the synchrony duet, a base for secure attachment, and a social reference who encourages exploration. Then infant emotions and experiences—cries and laughter, fears and joys—will ensure that psychosocial development goes well.

SUMMING UP The psychosocial impact of infant day care depends on many factors, including the culture. Although many nations pay mothers of infants to stay home with their babies, maternal employment does not seem harmful if someone else provides responsive care. Continuity is crucial; mothers, fathers, and others can all be good caregivers.

Cultures vary greatly not only in whether they provide paid child care, but whether they approve of such care. The United States tends to favor maternal care over center care but makes it difficult for families to survive without maternal employment.

WHAT HAVE YOU LEARNED?

1. What are the advantages of nonmaternal infant care?
2. What are the disadvantages of nonmaternal care?
3. What are gender and social class differences in the effects of nonmaternal care?
4. Why is it difficult to draw conclusions about the effects of infant day care?

SUMMARY

Emotional Development

1. Two emotions, contentment and distress, appear as soon as an infant is born. Smiles and laughter are evident in the early months. Between 4 and 8 months of age, anger emerges in reaction to restriction and frustration, and it becomes stronger by age 1.
2. Reflexive fear is apparent in very young infants. Fear of something specific, including fear of strangers and of separation, is typically strong toward the end of the first year.
3. In the second year, social awareness produces more selective fear, anger, and joy. As infants become increasingly self-aware, emotions emerge that encourage an interface between the self and others—specifically, pride, shame, and affection. Self-recognition (measured by the mirror/rouge test) emerges at about 18 months.

Brain and Emotions

4. Stress impedes early brain and emotional development. Some infants are particularly vulnerable to the effects of early maltreatment.
5. Temperament is a set of genetic traits whose expression is influenced by the context. Inborn temperament is linked to later personality, although plasticity is also evident. At least in the United States, parents tend to encourage exuberance and discourage fear.

The Development of Social Bonds

6. Often by 2 months, and clearly by 6 months, infants become more responsive and social, and synchrony is evident. Infants are disturbed by a still face because they expect and need social interaction.
7. Attachment, measured by the baby's reaction to the caregiver's presence, departure, and return in the Strange Situation, is crucial. Some infants seem indifferent (type A attachment—insecure-avoidant) or overly dependent (type C—insecure-resistant/ambivalent), instead of secure (type B). Disorganized attachment (type D) is the most worrisome. Secure attachment provides encouragement for infant exploration and may influence the person lifelong.
8. As they play, toddlers engage in social referencing, looking to other people's facial expressions and body language to detect what is safe, frightening, or fun. Fathers tend to help toddlers become more adventuresome.
9. Infants frequently use fathers as partners in synchrony, as attachment figures, and as social references, developing emotions and exploring their world via father caregiving.

Theories of Infant Psychosocial Development

10. According to all major theories, caregiver behavior is especially influential in the first two years. Freud stressed the mother's impact on oral and anal pleasure; Erikson emphasized trust and autonomy. Both believed that the impact of these is lifelong.
11. Behaviorists focus on learning; parents teach their babies many things, including when to be fearful or joyful. Cognitive theory holds that infants develop working models based on their experiences. Both these theories suggest that later developments can modify early experiences.
12. Humanism notes that some adults are stuck in their own unfinished development, which impairs their ability to give infants the loving responses they need.
13. Evolutionary theorists recognize that both infants and caregivers have impulses and emotions, developed over millennia, that foster the survival of each new member of the human species.

Infant Day Care

14. The impact of non-maternal care depends on many factors; it varies from one nation, one family, and even one child to another. Girls and infants from low-income households are more likely than boys from high-income households to benefit.
15. Although each theory and each culture has a somewhat different emphasis, all agree that quality of care (responsive, individualized, stable) is crucial, particularly in infancy, no matter who provides that care.

KEY TERMS

social smile (p. 204)
cortisol (p. 204)
separation anxiety (p. 205)
stranger wariness (p. 205)
self-awareness (p. 206)
temperament (p. 210)
goodness of fit (p. 212)
Big Five (p. 212)
synchrony (p. 213)
still-face technique (p. 214)
attachment (p. 215)
secure attachment (p. 217)
insecure-avoidant attachment (p. 217)
insecure-resistant/ambivalent attachment (p. 218)
disorganized attachment (p. 218)
Strange Situation (p. 218)
social referencing (p. 221)
trust versus mistrust (p. 225)
autonomy versus shame and doubt (p. 225)
social learning (p. 225)
proximal parenting (p. 226)
distal parenting (p. 226)
working model (p. 226)
allocare (p. 229)

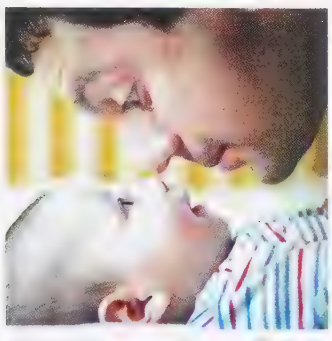
APPLICATIONS

1. One cultural factor influencing infant development is how infants are carried from place to place. Ask four mothers whose infants were born in each of the past four decades how they transported them—front or back carriers, facing out or in, strollers or carriages, in car seats or on mother's laps, and so on. Why did they choose the mode(s) they chose? What are their opinions and yours on how such cultural practices might affect infants' development?
2. Observe synchrony for three minutes. Ideally, ask the parent of an infant under 8 months of age to play with the infant. If no infant is available, observe a pair of lovers as they converse. Note the sequence and timing of every facial expression, sound, and gesture of both partners.
3. Telephone several day-care centers to try to assess the quality of care they provide. Ask about factors such as adult/child ratio, group size, and training for caregivers of children of various ages. Is there a minimum age? Why or why not? Analyze the answers, using Table 7.3 as a guide.

PART 2

The Developing Person So Far: The First Two Years





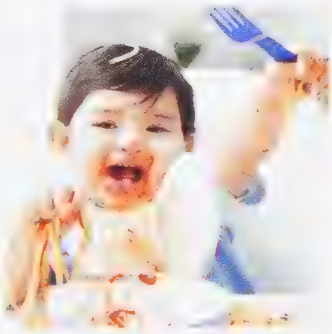
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BIOSOCIAL

Body Changes and Brain Development Over the first two years, body weight quadruples and brain weight triples. Connections between brain cells grow dense, with complex networks of dendrites and axons. Neurons become coated with myelin, sending messages more efficiently. Experiences that are universal (experience-expectant) and culture-bound (experience-dependent) aid brain growth, partly by pruning unused connections between neurons.

Perceiving and Moving Brain maturation underlies the development of all the senses. Seeing, hearing, and moving progress from reflexes to coordinated voluntary actions, including focusing, grasping, and walking. Culture is evident in sensory and motor development: Brain networks respond to the particular experiences of each infant's life.

Surviving in Good Health Infant health depends on immunization, parental practices (including "back to sleep"), and nutrition. Breast milk protects health and has so many other benefits that the World Health Organization recommends exclusive breast-feeding for the first four to six months. Survival rates are much higher today than even a few decades ago, with less marasmus and kwashiorkor, yet in some regions, infant growth is still stunted because of malnutrition.



JOSE LUIS PELAEZ INC/BLEND IMAGES/GETTY IMAGES

COGNITIVE

Sensorimotor Intelligence and Information Processing As Piaget describes it, in their first two years infants progress from knowing their world through immediate sensory experiences to "experimenting" on their world through actions and mental images. Information-processing theory stresses the links between sensory experiences and perception. Research finds traces of memory at 3 months, of object permanence at 4 months, and of deferred imitation at 9 months—all much younger ages than Piaget described.

Language Interaction with responsive adults exposes infants to the structures of communication and language. By age 1, infants usually speak a word or two. By age 2, language has exploded: Toddlers talk in short sentences and add vocabulary each day. Language develops through reinforcement, neurological maturation, and social motivation; all three processes combine to create a very conversational toddler.



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PSYCHOSOCIAL

Emotions Emotions are a newborn's simple reactions, but by age 2 a toddler's emotions have developed into complex, self-conscious responses. Infants' self-awareness and independence are shaped by parents and the culture. Much of basic temperament is inborn and apparent throughout life.

The Development of Social Bonds Parents and infants respond to each other by synchronizing their behavior. Toward the end of the first year, secure attachment to the parent sets the stage for the child's increasingly independent exploration of the world. Insecure attachment—avoidant, resistant, or disorganized—signifies a parent–child relationship that hinders learning. The effects may endure, although children and adults may develop new attachment patterns. Infants actively participate socially, using social referencing to interpret their experiences. Every theory has a somewhat different understanding of how early emotions develop. Mothers, fathers, and day-care providers encourage infants' social confidence, yet cultures differ markedly on how much allocare infants experience.



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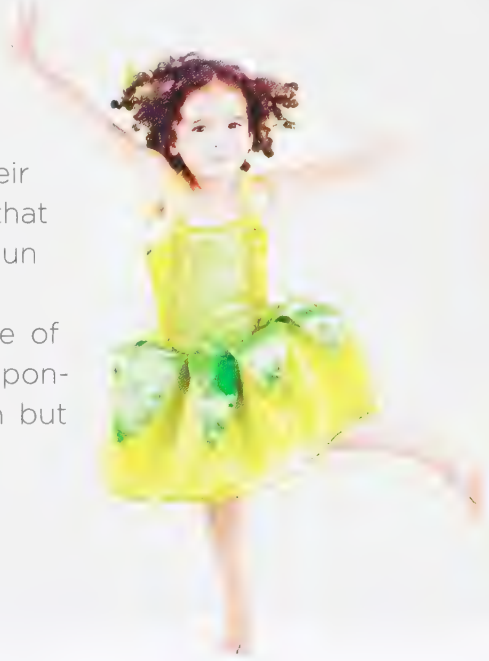
early childhood

From ages 2 to 6, children spend most of their waking hours discovering, creating, laughing, and imagining—all the while acquiring the skills they need. They chase each other and attempt new challenges (developing their bodies); they play with sounds, words, and ideas (developing their minds); they invent games and dramatize fantasies (learning social skills and morals).

These were once called the *preschool years* because school started in first grade. But first grade is no longer first; most children begin school before age 6. Therefore, we use the term *early childhood*.

These could also be called the play years, since young children love to play, whether quietly tracking a beetle through the grass or riotously turning a bedroom into a shambles. Their words and minds are playful, too; They explain that "a bald man has a barefoot head" or that "the sun shines so children can go outside to play."

Early childhood—by whatever name—is a time of extraordinary growth, impressive learning, and spontaneous play, joyful not only for young children but also for anyone who knows them.





CHAPTER 8

Early Childhood: Biosocial Development



1. Do children eat too much, too little, or just the right amount?
2. Does brain maturation make children laugh or cry too quickly?
3. If children never climb up trees or wade in water, do they suffer?
4. Are accidents accidental?
5. Which is worse, neglect or abuse?

- Body Changes
  - Growth Patterns
  - Nutrition
- Brain Development
  - Speed of Thought
  - The Brain's Connected Hemispheres
  - Emotions and the Brain
- Improving Motor Skills
  - Gross Motor Skills
  - A VIEW FROM SCIENCE: Eliminating Lead
  - Fine Motor Skills
  - Artistic Expression
- Injuries and Abuse
  - Avoidable Injury
  - A CASE TO STUDY: "My Baby Swallowed Poison"
  - Prevention
- Child Maltreatment
  - Definitions and Statistics
  - Frequency of Maltreatment
  - Consequences of Maltreatment
  - Prevention

When I was 4, I jumped off the back of our couch again and again, trying to fly. I did it many times because I tried it with and without a cape, with and without flapping my arms. My laughing mother wondered whether she had made a mistake in letting me see *Peter Pan*. An older woman warned that jumping would hurt my uterus. I didn't know what a uterus was, I didn't heed that lady, and I didn't stop until I decided I could not fly because I had no pixie dust.

When you were 4, I hope you also wanted to fly and someone laughed while keeping you safe. Protection, appreciation, and fantasy are all needed in early childhood. Do you remember trying to skip, climb a tree, or write your name? Young children try, fail, and try again. They become skilled and wise, eventually understanding some of life's limitations, including that humans have no wings. Advances in body and brain, and the need for adult protection, are themes of this chapter. Amazing growth, unexpected injury, and sobering maltreatment are all described.

Body Changes

In early childhood as in infancy, the body and brain develop according to powerful epigenetic forces—biologically driven and socially guided, experience-expectant and experience-dependent. (**Developmental Link:** Experience-expectant and experience-dependent brain development are explained in Chapter 5.) During this period, bodies and brains mature in size and function.

Growth Patterns

Compare an unsteady 24-month-old with a cartwheeling 6-year-old. Body differences are obvious. Height and weight increase greatly in those four years (by about a foot and 16 pounds, or almost 30 centimeters and 8 kilograms), but that is not the most remarkable change. During early childhood, proportions shift radically: Children slim down as the lower body lengthens and fat turns to muscle.



KATRINA WITT/AMP/GETTY IMAGES

Size and Balance These cousins are only four years apart, but note the doubling in leg length and marked improvement in balance. The 2-year-old needs to plant both legs on the sand, while the 6-year-old cavorts on one foot.

In fact, the average body mass index (BMI, a ratio of weight to height) is lower at ages 5 and 6 than at any other time of life. (**Developmental Link:** Body mass index is defined in Chapter 11.) Gone are the infant's protruding belly, round face, short limbs, and large head. The center of gravity moves from the breast to the belly, enabling cartwheels, somersaults, and many other motor skills. The joys of dancing, gymnastics, and pumping a swing become possible; changing proportions enable new achievements.

New shape and ability occur as weight and height increase. Over each year of early childhood, well-nourished children grow about 3 inches (about 7½ centimeters) and gain almost 4½ pounds (2 kilograms). By age 6, the average child in a developed nation:

- Is at least 3½ feet tall (more than 110 centimeters)
- Weighs between 40 and 50 pounds (between 18 and 23 kilograms)
- Looks lean, not chubby
- Has adult-like body proportions (legs constitute about half the total height)

When many ethnic groups live together in a nation with abundant food and adequate medical care, children of African descent tend to be tallest, followed by those of European, then Asian, and then Latino descent. However, height differences are greater *within* ethnic groups than *between* groups, evidence again that ethnic differences are not primarily biological.

Nutrition

Although they rarely starve, preschool children sometimes are malnourished, even in nations with abundant food. The main reason is that small appetites are often satiated by unhealthy foods, crowding out needed vitamins.

Adults often encourage children to eat, protecting them against famine that was common a century ago. Unfortunately, that encouragement is destructive in almost every nation. For example 30 years ago in Brazil, the most common nutritional problem was undernutrition; now it is overeating (Monteiro et al., 2004). Low-income Brazilians are particularly vulnerable, but even wealthy Brazilians eat a less nutritious, higher calorie diet than they did a few decades ago (Monteiro et al., 2011).

Victory! He's on his way. This boy participates in a British effort to combat childhood obesity; mother and son exercising in Liverpool Park is part of the solution. Harder to implement are dietary changes: Many parents let children eat as much as they want.



HOWARD BARLOW/ALAMY

In developed nations, children or grandchildren of immigrants are more likely to ingest inadequate amounts of healthy food than their elders who were born elsewhere (de Hoog et al., 2014). Further, the rate of poor nutrition increases as family income decreases; the same is true of obesity. Childhood obesity is not simply a problem in itself, it is also a marker of poor nutrition, and likely to reduce the functioning of the immune system lifelong (Rook et al., 2014).

There are many explanations of the increasing obesity as income falls. One is that many low-income children live with grandmothers who knew firsthand the dangers of malnutrition. They reward children with sweets, and they foster other eating patterns that combat starvation that no longer is a problem. They do not realize that traditional diets in Latin America or Africa are healthier than current foods advertised to children on television (de Hoog et al., 2014).

Of course, mothers and fathers also contribute to childhood obesity. Many family habits —less exercise, more television watching, fewer vegetables, more fast food—are more common in low-SES families than in those with wealthier, more educated parents (Cespedes et al., 2013).

Caregivers need to realize that appetite decreases between ages 2 and 6 because young children grow more slowly and need fewer calories per pound than

they did as infants. This is especially true for the current generation, who burn fewer calories because they are less active compared to children fifty years ago. Once most children lived in rural areas where they played outside all day. Instead of adjusting to this ecological change, many adults fret, threaten, and cajole children to overeat ("Eat all your dinner and you can have ice cream").

Many developmentalists promote more exercise in children. Such efforts are not always successful, as is evident from a study of many Latin American nations (Barboza, 2013). (**Developmental Link:** Obesity and exercise are discussed in Chapter 11.) There is good news in the United States, however. Obesity among preschoolers has declined slightly in recent years. It still is far too high (about 12 percent) but a combination of public education and parental action has led to improvement (MMWR, January 18, 2013; MMWR, August 9, 2013).

Nutritional Deficiencies

Although many young children consume more than enough calories, they do not always obtain adequate iron, zinc, and calcium. For example, North American children now drink less milk than formerly, which means they ingest less calcium and will have weaker bones later on.

Eating a wide variety of fresh foods may be essential for optimal health. Compared with the average child, those preschoolers who eat more dark-green and orange vegetables and less fried food benefit in many ways. They gain bone mass but not fat, according to a study that controlled for other factors that might correlate with body fat, such as gender (girls have more), ethnicity (people of some ethnic groups are genetically thinner), and income (poor children have worse diets) (Wosje et al., 2010).

Sugar is a major problem. Many customs entice children to eat sweets—in birthday cake, holiday candy, desserts, and other treats. Sweetened cereals and drinks (advertised as containing 100 percent of daily vitamins) are a poor substitute for a balanced, varied diet, partly because some nutrients have not yet been identified, much less listed on food labels. The lack of micronutrients is severe among people in poor nations, but vitamin pills and added supplements do not always help (Ramakrishnan et al., 2011).

Within the United States, children of all ethnicities drink more sweetened beverages than they once did, a problem particularly common among African Americans (de Hoog et al., 2014). They have a higher incidence of lactose intolerance, so they may avoid drinking milk. However, that may needlessly reduce nutrition. Most African Americans can digest some milk, and yogurt is a good calcium source if children are truly upset by lactose (Marette & Picard-Deland, 2014). However, yogurt is expensive and non-traditional, so parents need to be aware that yogurt drinks are far better for children than drinks with sugar or corn syrup.

An added complication is that an estimated 3 to 8 percent of all young children are allergic to a specific food, almost always a common, healthy one: Cow's milk, eggs, peanuts, tree nuts (such as almonds, walnuts, etc.), soy, wheat, fish, and shellfish are the usual culprits. Diagnostic standards for allergies vary (which explains the range of estimates), and treatment varies even more (Chafen et al., 2010).

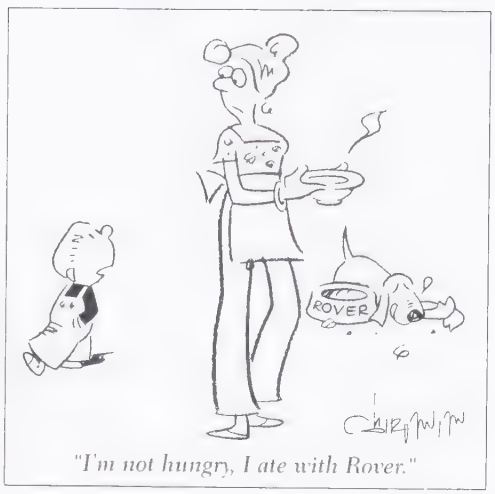
Some experts advocate total avoidance of the offending food—there are peanut-free schools, where no one is allowed to bring a peanut butter sandwich for lunch—but other experts suggest that tolerance should be gradually increased, beginning by giving babies a tiny bit of peanut butter (Reche et al., 2011). Indeed, exposure to peanuts can begin before birth: A study of pregnant women who

Especially for Nutritionists A parent complains that she prepares a variety of vegetables and fruits, but her 4-year-old wants only French fries and cake. What should you advise? (see response, page 245)



JO UNRUH/GETTY IMAGES

Apples, Blueberries, or Oranges Preschoolers love having a choice, so it is the adults' task to offer good options. Which book before bed? Which striped shirt before school? Which healthy snack before going out to play?



"I'm not hungry, I ate with Rover."

Eat Your Veggies On their own, children do not always eat wisely.

ingested peanuts found that their children were less likely to be allergic (Frazier et al., 2014). Fortunately, many childhood food allergies are outgrown, but since young children are already at nutritional risk, allergies make a balanced diet even harder.

Yet another complication is that many young children are compulsive about daily routines, insisting that bedtime be preceded by tooth-brushing, a book, and prayers—or by a snack, sitting on the toilet, and a song, in that order. My grandson always wanted a story, but not just any story. He told me it had to be a made-up story about an animal that has a problem that is solved by the end of the story. Thankfully, despite such very specific criteria, his literary standards were low, so I could comply. Whatever the routine, children expect it and are upset if someone puts them to bed without it.

Fortunately, as a team of experts contends, "Most, if not all, children exhibit normal age-dependent obsessive-compulsive behaviors [that are] usually gone by middle childhood" (March et al., 2004, p. 216). Parents need to balance their concern for good nutrition with the child's normal wish for sameness. This is another reason a variety of healthy foods, including some that may not be the family's usual fare, need to be fed early in life, before the child develops antipathy to particular fruits or vegetables.

Especially for Early-Childhood Teachers You know that young children are upset if forced to eat a food they hate, but you have eight 3-year-olds with eight different preferences. What do you do? (see response, page 246)

Oral Health

Not surprisingly, tooth decay correlates with obesity; both result from a diet with too much sugar and too little fiber (Hayden et al., 2013). More than one-third of all U.S. children under age 6 already have at least one cavity (Brickhouse et al., 2008). Sugary fruit drinks and soda are prime causes, and sugar-free soda contains acid that makes decay more likely (Holtzman, 2009).

"Baby" teeth are replaced naturally at about ages 6 to 10. The schedule is primarily genetic, with girls a few months ahead of boys. However, tooth care should begin years before the permanent teeth erupt. Severe tooth decay in early childhood harms those permanent teeth (which form below the first teeth) and can cause jaw malformation, chewing difficulties, and speech problems. The United States Preventive Services Task Force (a panel of experts in evidence-based medicine) urges pediatricians to add fluoride coats to the teeth of preschoolers who have no other source of fluoride, as that is proven to reduce cavities (Moyer, 2014).

Teeth are affected by diet and illness, which means that the state of a young child's teeth can alert the doctor or dentist to other health problems. The process works in reverse as well: Infected teeth can affect the rest of the child's body.

Most preschoolers visit the dentist if they have U.S.-born, middle-class parents; however, the less education parents have, the less likely they are to know the importance of early dental care (Horowitz et al., 2013).

If the parent was raised in a nation with inadequate dental care (sometimes evident in the number of toothless elders), they may not schedule dentist visits for their children or insist on tooth brushing. However, in many countries ignorance is not the problem; access and income are. In the United States, free dentistry is not available to most poor parents, who "want to do better" for their children's teeth than they did for their own (Lewis et al., 2010).

SUMMING UP Between ages 2 and 6, children's body proportions change as they grow taller and thinner, with variations depending on genes, nutrition, income, and ethnicity. Young children usually have small appetites and picky eating habits. Unfortunately, many adults encourage overeating, not realizing that being overweight leads to life-threatening illness. Obesity increases as education and income fall. Oral health is a serious problem: Many children eat unhealthy foods, especially too much sugar, developing cavities. If adults grew up in nations with few dentists, they may not realize that young children need to develop tooth-brushing habits and that seeing the dentist in early childhood is important for later health.

WHAT HAVE YOU LEARNED?

1. About how much does a well-nourished child grow in height and weight from ages 2 to 6?
2. Why do many adults overfeed children?
3. How do childhood allergies affect nutrition?
4. Why are today's children more at risk of obesity than children 50 years ago?
5. What specific measures should be part of oral health in early childhood?

Response for Nutritionists (from page 243): The nutritionally wise advice would be to offer only fruits, vegetables, and other nourishing, low-fat foods, counting on the child's eventual hunger to drive him or her to eat them. However, centuries of cultural custom make such wisdom difficult. A physical checkup, with a blood test, may be warranted to make sure the child is healthy.

Brain Development

Brains grow rapidly before birth and throughout infancy, as you saw in Chapter 5. By age 2, most neurons have connected to other neurons and substantial pruning has occurred. The 2-year-old's brain already weighs 75 percent of what it will weigh in adulthood; the 6-year-old's brain is 90 percent of adult weight. (The major structures of the brain are diagrammed in Figure 8.1)

Since most of the brain is already present and functioning by age 2, what remains to develop? The most important parts!

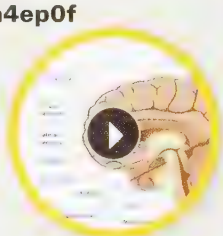
Although the brains and bodies of other primates seem better than humans in some ways (they climb trees earlier and faster, for instance) and although many animals have abilities humans lack (smell in dogs, for instance), humans have intellectual capacities far beyond any other animal. Considered from an evolutionary perspective, our brains allowed the human species to develop "a mode of living built on social cohesion, cooperation and efficient planning . . . survival of the smartest" seems more accurate than survival of the fittest" (Corballis, 2011, p. 194).

As the prefrontal cortex matures, social understanding develops, distinguishing humans from other primates. For example, a careful series of tests given to 106 chimpanzees, 32 orangutans, and 105 human 2½-year-olds found that young children were "equivalent . . . to chimpanzees on tasks of physical cognition but far outstripped both chimpanzees and orangutans on tasks of social cognition" such as pointing or following someone's gaze (Herrmann et al., 2007, p. 1365).

Children become better at controlling their emotions when they are with other people, no longer wailing, hitting, or laughing out loud on impulse. This is directly connected to brain development as time passes and family experiences continue, although how much of such control is brain-based and how much is a matter of earlier parenting is disputed (DeLisi, 2014; Kochanska et al., 2009). Nonetheless, gradual self-control is apparent.

For example, when a stranger greets them, many 2-year-olds are speechless, hiding behind their mothers if possible. By age 5, a kindergartner who hides is unusual. Adults may still feel shy, but they bravely respond. Brain scans of the prefrontal cortex and amygdala (soon described) taken at age 18 may show inhibition,

Video: Brain Development
Animation: Process of Myelination
http://qrs.ly/dn4ep0f



ALILA MEDICAL MEDIA/SHUTTERSTOCK

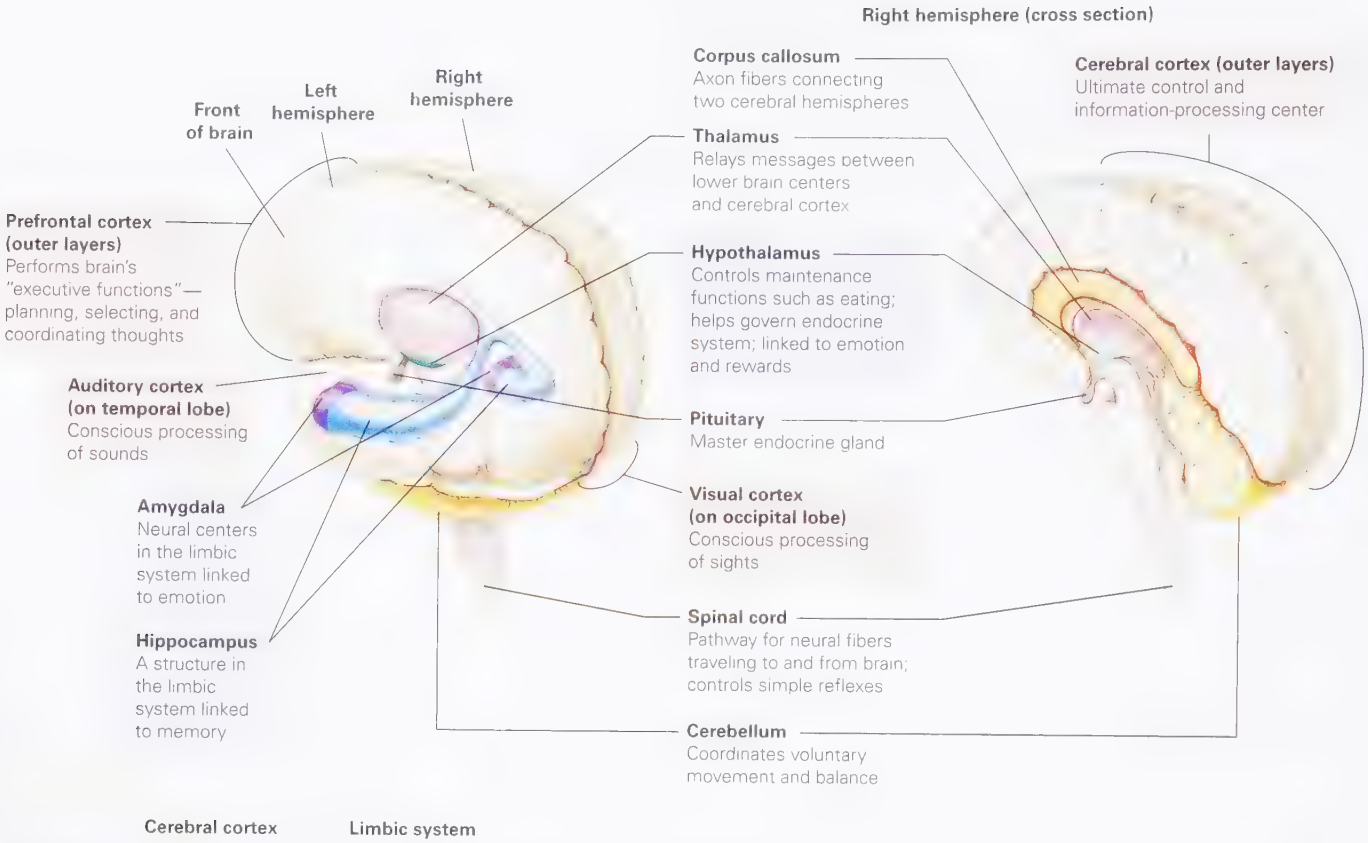


FIGURE 8.1

Connections A few of the dozens of named parts of the brain are shown here. Although each area has particular functions, the entire brain is interconnected. The processing of emotions, for example, occurs primarily in the limbic system, where many brain areas are involved, including the amygdala, hippocampus, and hypothalamus.

but most inhibited people no longer act in extremely anxious ways (Schwartz et al., 2010). (**Developmental Link:** Emotional regulation is further discussed in Chapter 10.)

Speed of Thought

After infancy, some brain growth is the result of proliferation of the communication pathways (dendrites and axons). However, most increased brain weight occurs because of **myelination.** *Myelin* (sometimes called the *white matter* of the brain) is a fatty coating on the axons that speeds signals between neurons (see Figure 8.2).

myelination The process by which axons become coated with myelin, a fatty substance that speeds the transmission of nerve impulses from neuron to neuron.

Although myelination continues for decades, the effects are especially apparent in early childhood (Silk & Wood, 2011). The areas of the brain that show greatest early myelination are the motor and sensory areas (Kolb & Whishaw, 2013), so preschoolers react more quickly to sounds and sights with every passing year.

Speed of thought from axon to neuron becomes pivotal when several thoughts must occur in rapid succession. By age 6, most children can see an object and immediately name it, catch a ball and throw it, write their ABCs in proper sequence, and so on. In fact, rapid naming of letters and objects—possible only when myelination is extensive—is a crucial indicator of later reading ability (Shanahan & Lonigan, 2010).

Of course, adults must be patient when listening to young children talk, helping them get dressed, or watching them write each letter of their names. Everything is done more slowly by 6-year-olds than by 16-year-olds because the younger chil-

Response for Early-Childhood Teachers (from page 244): Remember to keep food simple and familiar. Offer every child the same food, allowing refusal but no substitutes—unless for all eight. Children do not expect school and home routines to be identical; they eventually taste whatever other children enjoy.

dren's brains have less myelination, which slows information processing. However, thanks to myelination, older preschoolers are faster than toddlers, who sometimes forget what they were doing before they finish.

The Brain's Connected Hemispheres

One part of the brain that grows and myelinates rapidly during early childhood is the **corpus callosum,** a long, thick band of nerve fibers that connects the left and right sides of the brain. Growth of the corpus callosum makes communication between the hemispheres more efficient, allowing children to coordinate the two sides of their brains and hence, both sides of their bodies.

Serious disorders result when the corpus callosum fails to develop: This failure is one of several possible causes of autism (Frazier et al., 2012; Floris et al., 2013). Such failures lead to a variety of symptoms, always including intellectual disability (Cavalari & Donovick, 2014).

To understand the significance of the corpus callosum, note that each side of the body and brain specializes and is therefore dominant for certain functions. This is **lateralization,** literally, "sidedness." The entire human body is lateralized, apparent not only in right- or left-handedness but also in the feet, the eyes, the ears, and the brain itself. People prefer to kick a ball, wink an eye, or listen on the phone with their preferred foot, eye, or ear. Genes, prenatal hormones, and early experiences all affect which side does what. Lateralization advances with development of the corpus callosum (Kolb & Whishaw, 2013). The strength of lateralization varies—some people are more ambidextrous than others.

Left-handed people tend to have thicker corpus callosa than right-handed people do, perhaps because they need to readjust the interaction between the two sides of their bodies, depending on the task. For example, most left-handed people brush their teeth with their left hand because using their dominant hand is more natural, but they shake hands with their right hand because that is what the social convention requires.

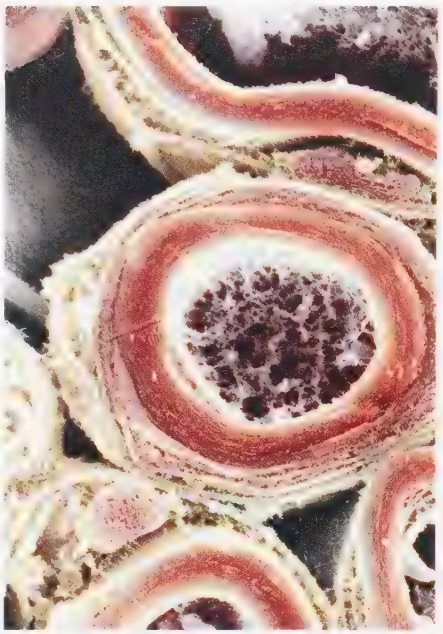
The Left-Handed Child

Infants and toddlers usually prefer one hand to the other for grabbing spoons and rattles. Indeed, there is evidence that lateralization begins in the womb, so some newborns are already left- or right-handed (Ratnarajah et al., 2013). By age 2 most children have a dominant hand for scribbling and throwing. Preschool teachers notice that about 1 child in 10 prefers the left hand.

Many cultures try to make every child right-handed, with some success. When left-handed children are forced to use their right hands, most learn to write right-handedly. But neurologically, success is incomplete: Their brains are only partly reprogrammed, as evidenced when they choose their left hand to comb their hair, throw a ball, or wield a hammer.

Many cultures imply that being right-handed is best, an example of the *difference-equals-deficit error,* explained in Chapter 1. Consider language: In English, a "left-handed compliment" is insincere, and no one wants to have "two left feet" or to be "out in left field." In Latin, *dexter* (as in *dexterity*) means "right" and *sinister* means "left" (and also "evil"). *Gauche,* the French word for *left,* means "socially awkward" in English. Many languages are written from left to right, which is easier for right-handed people.

The design of doorknobs, scissors, baseball mitts, instrument panels, and other objects favor the right hand. (Some manufacturers have special versions for lefties, but few young children know to ask for them.) In many Asian and African



DR. DAVID FURNESS, KEELE UNIVERSITY/SCIENCE SOURCE

FIGURE 8.2

Faster and Faster Myelination is a lifelong process. Shown here is a cross section of an axon (dark middle) coated with many layers of Schwann cells, as more and more myelin wraps around the axon throughout childhood. Age-related slowdowns in late adulthood are caused by the gradual disappearance of myelin layers.

corpus callosum A long, thick band of nerve fibers that connects the left and right hemispheres of the brain and allows communication between them.

lateralization Literally, "sidedness," referring to the specialization in certain functions by each side of the brain, with one side dominant for each activity. The left side of the brain controls the right side of the body, and vice versa.

Especially for Early-Childhood Teachers You know you should be patient, but frustration rises when your young charges dawdle on the walk to the playground a block away. What should you do? (see response, page 249)



Smarter than Most? Beware of stereotypes. Obviously, this student is a girl, Asian, left-handed, and attending a structured school (note the uniform). Each of these four characteristics leads some to conclude that she is more intelligent than other 7-year-olds. But all children have brains with the potential to learn: Specific teaching, not innate characteristics, is crucial.

cultures, only the left hand is used for wiping after defecation; it is an insult to give someone anything with that "dirty" hand.

Developmentalists advise against switching a child's handedness, not only because this causes adult–child conflicts and may create neurological confusion but also because left lateralization is an advantage in some professions, especially those involving creativity and split-second actions.

A disproportionate number of artists, musicians, and sports stars were/are left-handed, including Pele, Babe Ruth, Monica Seles, Bill Gates, Oprah Winfrey, Jimi Hendrix, Lady Gaga, and Justin Bieber. Using both sides of the body is an advantage: LeBron James writes left-handed but plays basketball right-handed. Five of the past six presidents of the United States were/are lefties: Gerald Ford, Ronald Reagan, George H.W. Bush, Bill Clinton, and Barack Obama.

Acceptance of left-handedness is more widespread now than a century ago. More adults in Great Britain and the United States claim to be left-handed today (about 10 percent) than in 1900 (about 3 percent) (McManus et al., 2010). There seem to be more left-handed men than women, as well as more left-handers in North America than elsewhere. Whether this is cultural or genetic is not known.

The Whole Brain

Astonishing studies of humans whose corpus callosa were severed to relieve severe epilepsy, as well as research on humans and other vertebrates with intact corpus callosa, have revealed how the brain's hemispheres specialize. Typically, the brain's left half controls the body's right side as well as areas dedicated to logical reasoning, detailed analysis, and the basics of language. The brain's right half controls the body's left side and areas dedicated to emotional and creative impulses, including appreciation of music, art, and poetry. Thus, the left side notices details and the right side grasps the big picture.

This left–right distinction has been exaggerated, especially when broadly applied to people (Hugdahl & Westerhausen, 2010). No one is exclusively left-brained or right-brained (except severely brain-damaged individuals). Moreover, the brain is plastic, especially in childhood, so a lost function in one hemisphere is sometimes replaced in the other hemisphere. (**Developmental Link:** Brain plasticity is discussed in Chapter 1.)

Both sides of the brain are usually involved in every skill. That is why the corpus callosum is crucial. As myelination progresses, signals between the two hemispheres become quicker and clearer, enabling children to become better thinkers and less clumsy. For example, no 2-year-old can hop on one foot, but most 6-year-olds can—an example of brain balancing. Many songs, dances, and games that young children love involve moving their bodies in some coordinated way—difficult, but fun because of that. Logic (left brain) without emotion (right brain) is a severe impairment, as is the opposite (Damasio, 2012).

Maturation of the Prefrontal Cortex

The entire frontal lobe continues to develop for many years after early childhood; dendrite density and myelination are still increasing in emerging adulthood. Nonetheless, neurological control advances significantly every year between ages 2 and 6, as is evident in several ways:

- Sleep becomes more regular.
- Emotions become more nuanced and responsive.
- Temper tantrums subside.
- Uncontrollable laughter and tears are less common.

One example of the maturing brain is in the game Simon Says. Players are supposed to follow the leader *only* when orders are preceded by the words "Simon says." Thus, if leaders touch their noses and say, "Simon says touch your nose," players are supposed to touch their noses, but when leaders touch their noses and say, "Touch your nose," no one is supposed to follow the example. Young children lose at this game because they impulsively do what they see and hear. Older children can think before acting. The prefrontal cortex works!

Such advances can be observed in every child, but might personal experience rather than brain maturation be the reason? A convincing demonstration that something neurological, not experiential, is the primary reason for these changes comes from a series of experiments with shapes and colors.

These experiments begin with young children given a set of cards with clear outlines of trucks or flowers, some red and some blue. They are asked to "play the shape game," putting trucks in one pile and flowers in another. Three-year-olds (and even some 2-year-olds) can do this correctly.

Then children are asked to "play the color game," sorting the cards by color. Most children under age 4 fail. Instead, they sort by shape, as they had done before. This basic test has been replicated in many nations; 3-year-olds usually get stuck in their initial sorting pattern. By age 5 (and sometimes age 4), most children make the switch.

When this result was first obtained, experimenters thought perhaps the children didn't have enough experience to know their colors; so the scientists switched the order, first playing "the color game." Most 3-year-olds did that correctly, because most 3-year-olds know the difference between red and blue. Then, when asked to play "the shape game," they sorted by color! Even with a new set of cards, such as yellow and green or rabbits and boats, 3-year-olds still tend to sort however they did originally, either by color or shape.

Researchers are looking into many possible explanations for this result (Müller et al., 2006; Marcovitch et al., 2010; Ramscar et al., 2013). All agree, however, that something in the brain must mature before children are able to switch from one way of sorting objects to another. (**Developmental Link:** Maturation of the prefrontal cortex is also discussed in Chapters 5, 11, and 14.)

Impulsiveness and Perseveration

Neurons have only two kinds of impulses: on–off or activate–inhibit. Each is signaled by biochemical messages from dendrites to axons to neurons. Both activation and inhibition are necessary for thoughtful adults, who neither leap too quickly nor hesitate too long. A balanced brain is best throughout life: One sign of cognitive loss in late adulthood is that some of the elderly become too cautious or too impulsive.

Many young children are notably unbalanced. They are impulsive, flitting from one activity to another. That explains why many 3-year-olds cannot stay quietly on one task, even in "circle time" in preschool, where each child is supposed to sit in place, not talking or touching anyone. Poor **impulse control** signfies a personality disorder in aduthood but not in early childhood. Few 3-year-olds are capable of sustained attention, which is required in primary school.

For some preschoolers, the see-saw tips in the opposite direction, when children play with a single toy for hours. **Perseveration** refers to the tendency to persevere in, or stick to, one thought or action, as evident in the card-sorting study just described (Hanania, 2010).

Many explanations for perseveration are plausible, and the tendency is unmistakable. Often young children repeat one phrase or question again and again, and

✓ **Response for Early-Childhood Teachers** (from page 247): One solution is to remind yourself that the children's brains are not yet myelinated enough to enable them to quickly walk, talk, or even button their jackets. Maturation has a major effect, as you will observe if you can schedule excursions in September and again in November. Progress, while still slow, will be a few seconds faster.

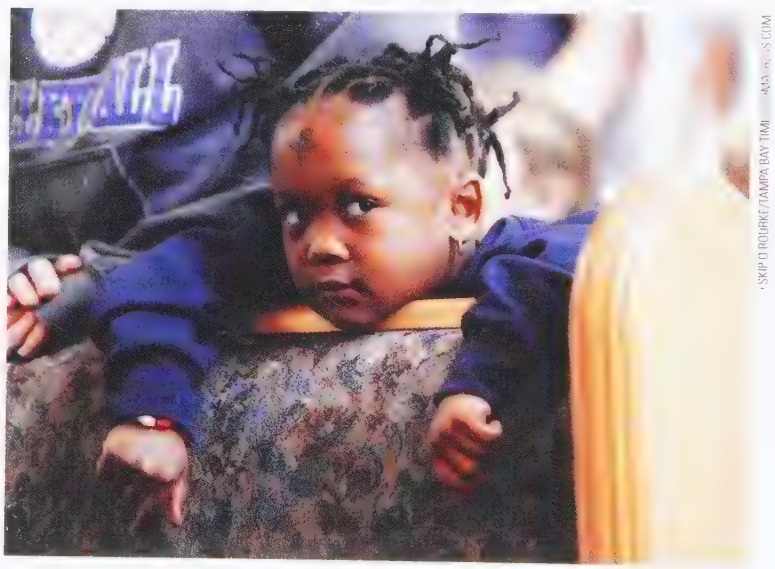
impulse control The ability to postpone or deny the immediate response to an idea or behavior.

perseveration The tendency to persevere in, or stick to, one thought or action for a long time.

often once they start giggling they find it hard to stop. Another example of perseveration occurs when a child has a tantrum when told to end an activity. (Wise teachers give a warning—"Cleanup in 5 minutes"—which may help.) The tantrum itself may perseverate. Crying may become uncontrollable because the child is stuck in the emotion that triggered the tantrum.

Impulsiveness and perseveration are opposite manifestations of the same underlying cause: immaturity of the prefrontal cortex. No young child is perfect at regulating attention; impulsiveness and perseveration are evident in every young child.

A longitudinal study of children from ages 3 to 6 found their ability to pay attention increased steadily, and that led to academic learning and behavioral control (fewer outbursts or tears) (Metcalfe et al., 2013). That development continues in middle childhood as brain maturation (innate) and emotional regulation (learned) allow most children to pay attention and switch activities as needed. By adolescence, teenagers change tasks at the sound of the bell.



Ashes to Ashes, Dust to Dust Many religious rituals have sustained humans of all ages for centuries, including listening quietly in church on Ash Wednesday—as Nailah Pierre tries to do. Sitting quietly is developmentally difficult for young children, but for three reasons she may succeed: (1) gender (girls mature earlier than boys), (2) experience (she has been in church many times), and (3) social context (she is one of 750 students in her school attending a special service at Nativity Catholic church).

Exceptions include children with attention-deficit/hyperactivity disorder (ADHD), who are too impulsive for their age. An imbalance between the left and right sides of the prefrontal cortex and abnormal growth of the corpus callosum seem to underlie (and perhaps cause) ADHD (Gilliam et al., 2011).

As with all biological maturation, development of impulse control and behavioral flexibility is related to upbringing. A study of Korean preschoolers found that they developed impulse control and reduced perseveration sooner than a comparable group of English children. This study included the shape–color task: At age 3, 40 percent of Korean children but only 14 percent of British ones successfully shifted from sorting by shape to color. The researchers considered many possible reasons and concluded that "a cultural explanation is more likely" (Oh & Lewis, 2008, p. 96).

Emotions and the Brain

Now that we have considered the prefrontal cortex, we turn to another region of the brain, sometimes called the *limbic system*, the major system for emotions. Emotional expression and emotional regulation advance during early childhood. (**Developmental Link:** Emotional regulation is discussed further in Chapters 10

and 15.) Crucial to that advance are three parts of the brain—the amygdala, the hippocampus, and the hypothalamus.

The Limbic System

The **amygdala** is a tiny structure deep in the brain. It registers emotions, both positive and negative, especially fear (Kolb & Whishaw, 2013). Increased amygdala activity is one reason some young children have terrifying nightmares or sudden terrors, overwhelming the prefrontal cortex. Similarly, a child may refuse to enter an elevator or may be hysterical at a nightmare.

amygdala A tiny brain structure that registers emotions, particularly fear and anxiety.

The amygdala responds to comfort but not to logic. If a child is terrified of, say, a dream of a lion in the closet, an adult should not laugh but might open the closet door and command the lion to go home.

Another structure in the emotional network is the **hippocampus,** located next to the amygdala. A central processor of memory, especially memory for locations, the hippocampus responds to the anxieties of the amygdala by summoning memory. A child can remember, for instance, whether previous elevator riding was scary or fun.

hippocampus A brain structure that is a central processor of memory, especially memory for locations.

Early memories of location are fragile because the hippocampus is still developing. Nonetheless, emotional memories from early childhood can interfere with expressed, rational thinking: An adult might have a panic attack but not know why.

The interaction of the amygdala and the hippocampus is sometimes helpful, sometimes not; fear can be constructive or destructive (LaBar, 2007). Studies of animals find that when the amygdala is surgically removed, the animals are fearless in situations that should scare them. For instance, a cat without an amygdala will stroll nonchalantly past monkeys—something no normal cat would do (Kolb & Whishaw, 2013).

A third part of the limbic system, the **hypothalamus,** responds to signals from the amygdala (arousing) and from the hippocampus (usually dampening) by producing cortisol, oxytocin, and other hormones that activate parts of the brain and body (see Figure 8.3). Ideally, this hormone production occurs in moderation. Both temperamental inhibition and parental responses affect whether or not the hypothalamus will overreact, making the preschooler too anxious—as about 20 percent of 4- to 7-year-olds are (Paulus et al., 2014).

hypothalamus A brain area that responds to the amygdala and the hippocampus to produce hormones that activate other parts of the brain and body.

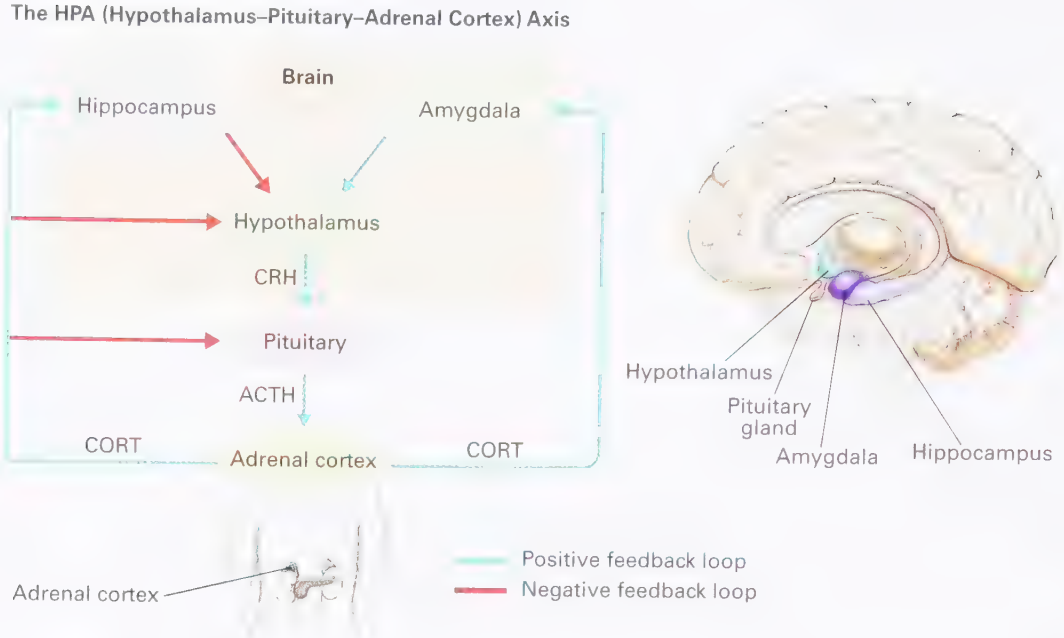
As the limbic system develops, young children watch their parents' emotions closely. If a parent looks worried when entering an elevator, the child may fearfully cling to the parent when the elevator moves. If this sequence recurs often enough, the child may become hypersensitive to elevators, as fear from the amygdala joins memories from the hippocampus, increasing cortisol production via the hypothalamus. If, instead, the parent makes elevator riding fun (letting the child push the buttons, for instance), initial fears subside, and the child's brain will be aroused to enjoy elevators—even when there is no need to go from floor to floor.

Especially for Neurologists Why do many experts think the limbic system is an oversimplified explanation of brain function? (see response, page 253)

Knowing the varieties of fears and joys is helpful when a teacher takes a group of young children on a trip. To stick with the elevator example, one child might be terrified while another child might rush forward, pushing the close button before the teacher enters. Every experience (elevators, fire engines, train rides, animals at the zoo, a police officer) is likely to trigger a range of emotions, without much reflection, in a group of 3-year-olds: A class trip needs several adults, ready to respond to whatever reactions the children have.

Stress Hormones

During infancy and early childhood, extreme stress may cause cortisol to flood the brain and destroy part of the hippocampus. There is "extensive evidence of the



Source: Davis et al., 2003, p. 183

FIGURE 8.3

A Hormonal Feedback Loop This diagram simplifies a hormonal linkage, the HPA (hypothalamus–pituitary–adrenal) axis. Both the hippocampus and the amygdala stimulate the hypothalamus to produce CRH (corticotropin-releasing hormone), which in turn signals the pituitary gland to produce ACTH (adrenocorticotropic hormone). ACTH then triggers the production of CORT (glucocorticoids) by the adrenal cortex (the outer layers of the adrenal glands, atop the kidneys). Fear may either build or disappear, depending on other factors, including how the various parts of the brain interpret that first alert from the amygdala.

disruptive impacts of toxic stress" (Shonkoff et al., 2012). Too much of that hormone early in life may lead to permanent deficits in learning and health, causing major depression, post-traumatic stress disorder, and attention-deficit/hyperactivity disorder in childhood and adolescence.

Yet some stress is needed for normal brain growth. Emotionally arousing experiences—meeting new friends, entering school, visiting a strange place—seem beneficial if a young child has someone or something to moderate the stress. Parental support and child temperament at age 3 are crucial moderators. When past support and experience are in place, cortisol will not be overwhelming. A study of 5- and 6-year-olds exposed to a stressful experience found that cortisol rose dramatically in some children but not at all in others, probably because of individual variations in genes and early childhood experiences (de Weerth et al., 2013).

In an experiment, brain scans and hormone measurements were taken of 4- to 6-year-olds immediately after a fire alarm. (Teoh & Lamb, 2013). As measured by their cortisol levels, some children were upset and some were not. Two weeks later, they were questioned about the event. Those with higher cortisol reactions to the alarm remembered more details than did those with less stress, which suggests that some stress aided memory. There are good evolutionary reasons for that: People need to remember experiences that arouse their emotions, so they can avoid, or adjust to, similar experiences in the future.

Generally, a balance between arousal and reassurance is needed. For instance, if children are witnesses to a crime (a stressful experience), a child's memory is

LaunchPad

Video Activity: The Childhood Stress-Cortisol Connection examines how high cortisol levels can negatively impact a child's overall health.



Good Excuse It is true that emotional control of selfish instincts is difficult for young children because the prefrontal cortex is not yet mature enough to regulate some emotions. However, family practices can advance social understanding.

more accurate when an interviewer is warm and attentive, listening carefully but not suggesting some answers instead of others (Teoh & Lamb, 2013).

Studies of maltreated children suggest that excessive stress hormone levels in early childhood permanently damage the brain. The impaired hypothalamus produces hormones that affect emotions lifelong (Evans & Kim, 2013; Wilson et al., 2011).

Sadly, this topic leads again to those adopted Romanian children mentioned in Chapter 7. When some of them (presumably those who experienced more stress) saw pictures of happy, sad, frightened, or angry faces, their limbic systems were less reactive than were those of Romanian children who were living with their biological parents. The adopted children's brains were also less lateralized, suggesting less specialized, less efficient thinking (Nelson et al., 2014). Thus, early stress had probably impaired their brains.

Romania no longer permits wholesale international adoptions. Nonetheless, as mentioned earlier, some children are raised in institutions. They are confined to cribs most of the time, and are severely impaired in motor skills, as well as language and social bonding. As you remember, adoption (local or international) should occur before age 1 for the best outcomes.

That is not always possible, however. In one study, at about age 2 some institutionalized Romanian children were randomly assigned to well-paid and trained foster parents. By age 4, they were smarter (by about 10 IQ points) than those who remained institutionalized (Nelson et al., 2007). This research suggests that ages 2 to 4 constitute a sensitive time for learning because families are able to balance challenge and comfort for each individual, allowing normal brain maturation.

Unfortunately, although these children did better than those who remained in institutions, they lagged behind another group who were with their parents the whole time. That group did not receive excellent physical and medical care, as the foster children did, but they were loved and stimulated by growing up in their families. In neurological development, that made all the difference (Marshall, 2014).

Response for Neurologists (from page 251): The more we discover about the brain, the more complex we realize it is. Each part has specific functions and is connected to every other part.

SUMMING UP The brain continues to mature during early childhood. Myelination is notable in several crucial areas. One is the corpus callosum, which connects the two sides of the brain and therefore allows control of the two sides of the body. The human brain and body are lateralized, which means left-handed children are so because of their brain functioning. Many cultures and parents have tried to make them right-handed, a practice that developmentalists discourage.

Increased myelination speeds up actions and reactions. Furthermore, the prefrontal cortex enables the balancing of action and inhibition, allowing children to think before they act and to stop one action to begin another. As impulsiveness and perseveration decrease, children become better able to learn.

Several key areas of the brain—including the amygdala, the hippocampus, and the hypothalamus—are involved in emotions. Children whose early experiences are highly stressful and who lack nurturing caregivers may be impaired in emotional regulation and expression.

WHAT HAVE YOU LEARNED?

1. How much does the brain grow from ages 2 to 6?
2. Why is myelination important for thinking and motor skills?
3. What is the function of the corpus callosum?
4. What should parents do if their toddler seems left-handed?
5. How does the prefrontal cortex affect impulsivity and perseveration?
6. What is the function of each of the three areas of the brain that are part of the limbic system?
7. Is stress beneficial or harmful to young children?

Improving Motor Skills

Maturation of the prefrontal cortex allows impulse control, and myelination of the corpus callosum and lateralization of the brain permit better physical coordination. No wonder children move with greater speed, agility, and grace as they age (see Visualizing Development, p. 255).

Mastery of gross and fine motor skills results not only from maturation but also from extensive, active play. A study in Brazil, Kenya, and the United States tracked how young children spend their time. Cultural variations and differences based on socioeconomic status (SES) emerged, but at every income level in all three nations, children spent more time playing than doing anything else—including chores, lessons, and conversations (Tudge et al., 2006).

Gross Motor Skills

Gross motor skills improve dramatically. When playing, many 2-year-olds fall down and bump clumsily into each other. By contrast, some 5-year-olds are skilled and graceful, performing coordinated dance steps or sports moves.

There remains much for them to learn, especially in the ability to adjust to other people and circumstances. Thus a 5-year-old can sometimes kick a ball with precision, but it is much harder for that child to be a good team player on a soccer team. At every age and skill, physical maturity precedes social maturity.

Specific Skills

Many North American 5-year-olds can ride a tricycle, climb a ladder, and pump a swing, as well as throw, catch, and kick a ball. A few can do these things by age 3.

VISUALIZING DEVELOPMENT

Developing Motor Skills

Every child can do more with each passing year. These examples detail what one child might be expected to accomplish from ages 2 to 6. But each child is unique, and much depends on culture, practice, and maturity.

SKILLS

AVERAGE HEIGHT IN INCHES
BOYS 45.5 GIRLS 45.0

Draw and paint recognizable images
Write simple words
Read a page of print
Tie shoes
Catch a small ball

6 years



PHOTO: AARON BILFORD/SHUTTERSTOCK

BOYS 43.0 GIRLS 42.5

Skip and gallop in rhythm
Clap, bang, sing in rhythm
Copy difficult shapes and letters
Climb trees, jump over things
Use a knife to cut
Wash face, comb hair



PHOTO: RAMONA HEIM/SHUTTERSTOCK

BOYS 40.5 GIRLS 40.0

Catch a beach ball
Use scissors
Hop on either foot
Feed self with fork
Dress self
Copy most letters
Pour juice without spilling
Brush teeth

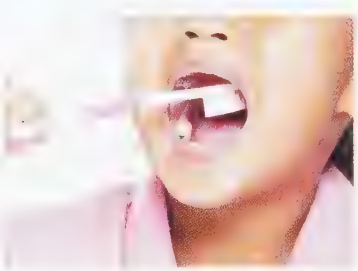


PHOTO: NALUWAN/SHUTTERSTOCK

BOYS 37.5 GIRLS 37.0

Kick and throw a ball
Jump with both feet
Pedal a tricycle
Copy simple shapes
Walk down stairs
Climb ladders



PHOTO: NEJRON PHOTO/SHUTTERSTOCK

BOYS 34.1 GIRLS 33.5

Run without falling
Climb out of crib
Walk up stairs
Feed self with spoon
Draw spirals



PHOTO: ARTEMIS MYSHKIN/SHUTTERSTOCK

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and some 5-year-olds can already skate, dive, and ride a bike—activities that demand balanced coordination and use of both brain hemispheres. Elsewhere, some 5-year-olds swim in oceans or climb cliffs. Brain maturation, motivation, and guided practice undergird all motor skills.

Adults need to make sure children have a safe space to play, with time, appropriate equipment, and playmates. Children learn best from peers who demonstrate whatever the child is ready to try, from catching a ball to climbing a tree. Of course, culture and locale influence particulars: Some small children learn to ski, others to sail.



TIMOTHY A. CLARY/AFP/GETTY IMAGES



SILVA KAWAMOTO/GETTY IMAGES

Practice with the Big Kids Ava is unable to stand as Carlyann can (*left*) but she is thrilled to be wearing her tutu in Central Park, New York, with 230 other dancers in a highly organized attempt to break a record for the most ballerinas on pointe at the same moment. Motor skills are developing in exactly the same way on the other side of the world (*right*) despite superficial opposites (boys, Japan, soccer, pick-up game).

Recent urbanization concerns many developmentalists. A century ago, children with varied skill levels played together in empty lots or fields without adult supervision, but now more than half the world's children live in cities. Many of these are "megacities . . . overwhelmed with burgeoning slums and environmental problems" (Ash et al., 2008, p. 739).

Crowded, violent streets not only impede development of gross motor skills but also add to the natural fears of the immature amygdala, compounded by the learned fears of adults. Gone are the days when parents told their children to go out and play, to return when hunger, rain, or nightfall brought them home. Now many parents fear strangers and traffic, keeping their 3- to 5-year-olds inside (Taylor et al., 2009).

That worries many childhood educators, who believe that children need space and freedom to play in order to develop well. Indeed, many agree that "Environment is the Third Teacher . . . because the environment is viewed as another teacher having the power to enhance children's sense of wonder and capacity for learning" (Stremmel, 2012, p. 136).

Environmental Hazards

Observable dangers are not the only reason children are slower to develop skilled gross motor skills. Such skills require practice to develop, but children who breathe heavily polluted air tend to be impaired in brain development as well as to exercise less. Often they also live in crowded neighborhoods and attend poor schools. They

have underdeveloped motor skills as well as more learning problems than children living where the air is clean. Are we certain that dirty air impairs their development, or is the cause really something else?

Scientists have grappled with this question and and found that environmental substances impair brain development in young children at every SES level, especially those in lower-income families. This conclusion is easiest to demonstrate with asthma, which reduces oxygen to the brain. In the United States, asthma is far more prevalent among children who live in poverty than among those who do not (U.S. Department of Health and Human Services, 2012, November). (**Developmental Link:** Asthma is discussed in Chapter 11.)

As you already know, the dynamic-systems approach to development means that every impairment has many causes, both in the immediate context and in past genetic and environmental factors. Nonetheless, a recent study conducted in British Columbia, where universal public health care and detailed birth records allow solid research, showed that air pollution from traffic and industry early in life was a cause, not just a correlate, of asthma (Clark et al., 2010).

This study began with all births in 1999 and 2000 in southwest British Columbia (which includes a major city, Vancouver). For three years, 37,401 children were studied, 3,482 of whom were diagnosed with asthma by age 3. Each of those 3,482 was matched on SES, gender, and so on with five other children from the same group. Exposure to air pollution (including carbon monoxide, nitric oxide, nitrogen dioxide, particulate matter, ozone, sulfur dioxide, black carbon, wood smoke, car exhaust, and smoke from parents' cigarettes) was carefully measured.

One finding was that parents could not always protect their children, partly because they did not know when substances caused poor health. For example, although carbon monoxide emissions are not visible, when compared to their five matched peers, those children who were diagnosed with asthma were more likely to live near major highways, where carbon monoxide is prevalent. Conversely, because wood smoke is easy to see and smell, some parents tried to avoid it, but burning wood did not increase asthma.

Respiratory problems are not the only early-childhood complications caused by pollution. Research on lower animals suggests that hundreds of substances in the air, food, and water affect the brain and thus impede balance, motor skills, and motivation. Many substances have not been tested, but some—including lead in the water and air, pesticides in the soil or on clothing, bisphenol A (BPA) in plastic, and secondhand cigarette smoke—are proven harmful.

One recent concern is the contamination from *e-waste,* a term that includes discarded computers, cell phones, and other outmoded electronic devices. E-waste may spew pollutants that affect the brains of infants and children, although not all scientists are convinced. As one group of researchers explains: "Although data suggest that exposure to e-waste is harmful to health, more well designed epidemiological investigations in vulnerable populations, especially pregnant women and children, are needed to confirm these associations" (Grant et al., 2013, p. e357).

The administrator of environmental public health for the state of Oregon said, "We simply do not know—as scientists, as regulators, as health professionals—the health impacts of the soup of chemicals to which we expose human beings" (Shibley, quoted in T. D. Johnson, 2011). Whether you think Shibley is needlessly alarmist or is simply stating the obvious depends on your own perspective—and maybe on your amygdala.

Lead, however, has been thoroughly researched. There is no doubt that lead is severely toxic. The history of lead exposure in the following A View from Science illustrates the long path from science to practice.

a view from science

Eliminating Lead

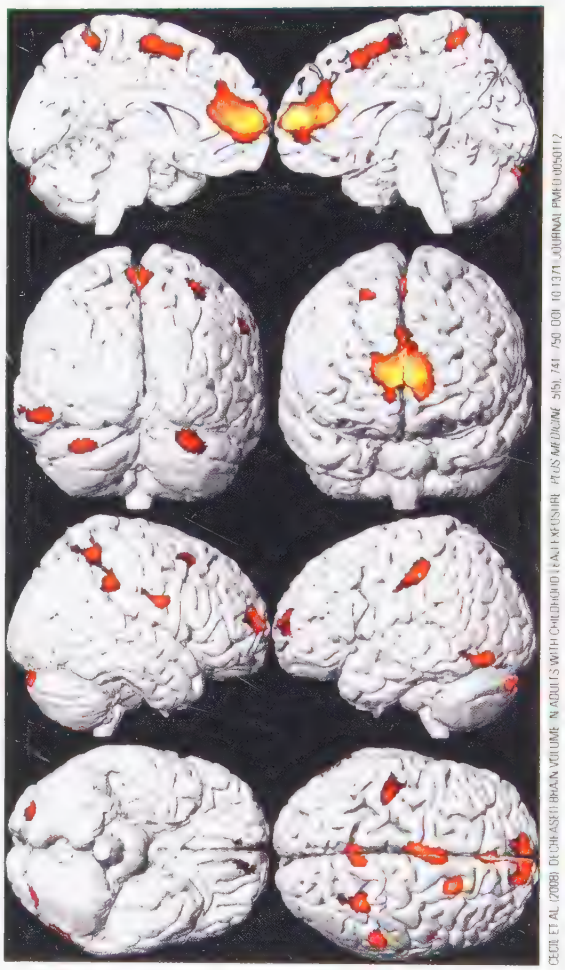
Lead was recognized as a poison a century ago (Hamilton, 1914). The symptoms of *plumbism*, as lead poisoning is called, were obvious—intellectual disability, hyperactivity, and even death if the level reached 70 micrograms per deciliter of blood.

The lead industry defended the heavy metal. Manufacturers argued that low levels were harmless, and blamed parents for letting their children eat flaking chips of lead paint (which tastes sweet). Further, since children with high levels of lead in their blood were often from low-SES families, some argued that malnutrition, inadequate schools, family conditions, or a host of other causes were the reasons for their reduced IQ (Scarr, 1985). This seemed plausible to many developmentalists. I am chagrined to confess that explanation made sense to me when I wrote the first edition of this textbook (Berger, 1980).

Consequently, lead remained a major ingredient in paint (it speeds drying) and in gasoline (it raises octane) for most of the twentieth century. The fact that babies in lead-painted cribs, that preschoolers playing near traffic, and that children living beside industrial waste were intellectually impaired and hyperactive was claimed to be correlation, not causation.

Finally, chemical analysis of blood and teeth, with careful longitudinal and replicated research, proved that lead was indeed a poison for all children (Needleman et al., 1990; Needleman & Gatsonis, 1990). The United States banned lead in paint (in 1978) and automobile fuel (in 1996). The blood level that caused plumbism was set at 40 micrograms per deciliter, then 20, then 10, (and recently, danger is thought to begin at 5 micrograms), but no level has been proven to be risk-free (MMWR, April 5, 2013).

Regulation has made a difference: The percentage of U.S. 1- to 5-year-olds with more than 5 micrograms of lead per deciliter of blood was 8.6 percent in 1999–2001, 4.1% in 2003–2006, and 2.6 percent in 2007–2010 (see Figure 8.4). Children who are young, low-SES, and/or living in old housing tend to have higher levels (MMWR, April 5, 2013) and lower IQs.



Toxic Shrinkage A composite of 157 brains of adults—who, as children, had high lead levels in their blood—shows reduced volume. The red and yellow hot spots are all areas that are smaller than areas in a normal brain. No wonder lead-exposed children have multiple intellectual and behavioral problems.

Fine Motor Skills

Fine motor skills are harder to master than gross motor skills. Whistling, winking, and especially writing are difficult. Pouring juice into a glass, cutting food with a knife, and achieving anything more artful than a scribble with a pencil all require a level of muscular control, patience, and judgment that is beyond most 2-year-olds.

Many fine motor skills involve two hands and thus both sides of the brain: The fork stabs the meat while the knife cuts it; one hand steadies the paper while the

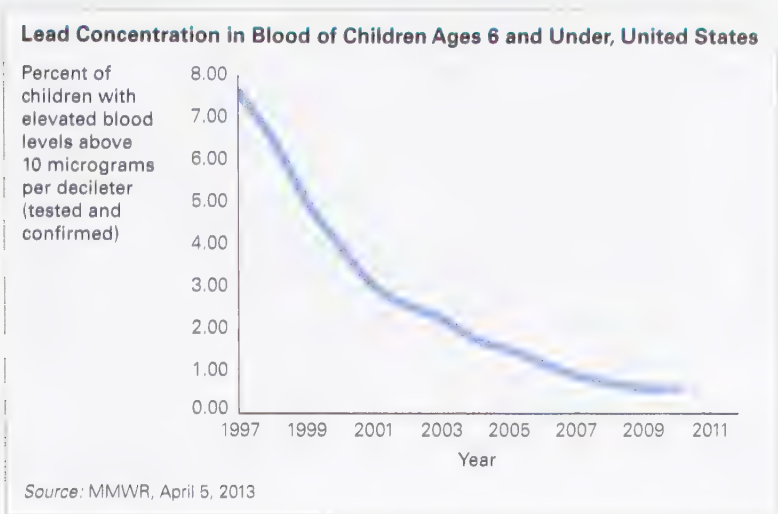


FIGURE 8.4

Dramatic Improvement in a Decade Once researchers established the perils of high lead levels in children's blood, the percentage of children suffering from plumbism fell by more than 300 percent. Levels are higher in states that once had heavy manufacturing and lower in mountain and Pacific states.

Parents now take precautions. They are increasing their children's calcium intake, wiping window ledges clean, testing drinking water, avoiding lead-based medicines and crockery (available in some other nations), and making sure children never eat chips of lead-based paint.

In some states (e.g., Colorado and Wyoming), average lead levels for young children are close to zero. In other states that once had extensive lead-based manufacturing, young children are still at risk, probably because of lead in the soil and dust. In 2010, Pennsylvania documented 509 children under age 6 with more than 20 micrograms per deciliter in their blood; Ohio had 417; and Michigan had 254 (National Center for Environmental Health, 2012).

Remember from Chapter 1 that scientists sometimes use data collected for other reasons to draw new conclusions. This is the case with lead. About 15 years after the sharp decline in blood lead levels in preschool children, the rate of violent crime committed by teenagers and young adults fell sharply. Coincidence? Some scientists decided to test it. As it happened, some nations reduced lead in the environment sooner or later than others, and crime rates plummeted 15 years later in each nation. Teenagers with less lead in their blood as infants committed fewer crimes. Again this could be correlation, not causation, but this time researchers hesitate to make that argument.

A scientist comparing these trends concluded that some teenagers commit impulsive, violent crimes because their brains were poisoned by lead years ago. The correlation is found not only in the United States but also in every nation that has reliable data on lead and crime—Canada, Germany, Italy, Australia, New Zealand, France, and Finland (Nevin, 2007). In the past decade, many researchers have found that lead levels in early childhood predict later attention deficits, school suspensions (Amato et al., 2013; Goodlad et al., 2013), and juvenile delinquency.

There is now no doubt that lead, even at quite low levels in the blood of a young child, harms the brain. That raises many other questions about the effects of brain damage, and about the long-term effects of hundreds, perhaps thousands, of new chemicals in the air, water, and soil.

other writes; tying shoes, buttoning shirts, cutting paper, and zipping zippers require both hands.

Limited myelination of the corpus callosum may be the underlying reason that shoelaces get knotted, paper gets ripped, and zippers get stuck. Short, stubby fingers add to the problem. As with gross motor skills, practice and maturation are key; using glue, markers, and scraps of cloth are part of the preschool curriculum.





Same Situation, Far Apart: Finger Skills Children learn whatever motor skills their culture teaches. Some master chopsticks, with fingers to spare; others cut sausage with a knife and fork. Unlike these children in Japan (*left*) and Germany (*right*), some never master either, because about one-third of adults worldwide eat directly with their hands.

Especially for Immigrant Parents You and your family eat with chopsticks at home, but you want your children to feel comfortable in Western culture. Should you change your family's eating customs? (see response, page 262)

Puzzles—with large pieces of splinter-proof wood or heavy, smooth cardboard—are essential supplies.

Traditional academic learning depends on fine motor skills and body control. Writing requires finger control, reading a line of print requires eye control, classroom schedules require bladder control, and so on. These are beyond most young children, so even the brightest 3-year-old is not allowed in first grade.

Slow maturation is one reason many 6-year-olds are frustrated if their teachers demand that they write neatly and cut straight. Some educators suggest waiting until a child is "ready" for school; some suggest that preschools should focus on readiness; still others suggest that schools should adjust to the immaturity of the child, instead of trying to make the child adjust. This controversy is explored in the next chapter.

Fine motor skills—like many other biological characteristics, such as bones, brains, and teeth—mature on average about six months earlier in girls than in boys. By contrast, boys often are ahead of girls in gross motor skills.

Many studies find that fine motor skills correlate with later school performance, which may be one reason that primary school girls typically outperform boys on tests of reading and writing. Although these gender differences seem to be biological, they may be the result of motivation and practice, as young girls are more likely to dress up and play with dolls (fine motor skills), while boys are more likely to climb and kick (gross motor skills) (Saraiva et al., 2013).

Artistic Expression

Young children are imaginative, creative, and not yet self-critical. They love to express themselves, especially if their parents applaud their performances, display their artwork, and otherwise communicate approval. The fact that their fine motor skills are immature, and thus their drawings lack precision, is irrelevant. Perhaps the immaturity of the prefrontal cortex is a blessing, allowing the creativity without self-criticism.

All forms of artistic expression blossom during early childhood; 2- to 6-year-olds love to dance around the room, build an elaborate tower of blocks, make music by pounding in rhythm, and put bright marks on shiny paper. In every artistic domain, skill takes both practice and maturation.

For example when drawing a person, 2- to 3-year-olds usually draw a "tadpole"—a circle head, dots for eyes, sometimes a smiling mouth, and then a line or two beneath to indicate the rest of the body. Gradually, tadpoles get torsos, limbs, hair, and so on. Children's artwork is not intended to be realistic: It communi-

cates thoughts and self-expression (Papandreou, 2014). It is a mistake for adults to say "that looks like a . . ." or worse, "you forgot the feet."

Cultural and cohort differences are apparent in all artistic skills. For the most part, Chinese culture incorporates the idea that drawing benefits from instruction, so young children are guided in how best to draw a person, a house, and—most important for the Chinese—a word.

Consequently, by age 9, Chinese children draw more advanced pictures than children of other cultures. Adult encouragement, child practice, and developing technical skill correlate with more mature, creative drawings a few years later (Chan & Zhao, 2010; Huntsinger et al., 2011).

Some parents enroll their preschool children in music lessons, hoping they will learn to play. As a result, those preschoolers become better at listening to sounds, evident in listening to speech as well as music. Neurological evidence finds that their brains reflect their new auditory abilities, a remarkable testimony to the role of family and cultural encouragement of preschool art (Strait et al., 2013).



AMY WHITT/RADIUS IMAGES/GETTY IMAGES

Bliss for Boys But not for moms. Finger painting develops fine motor skills, which is part of the preschool curriculum in early childhood. This boy shows why most stay-at-home 3-year-olds miss out on this joy.

SUMMING UP Maturation of the brain leads to better hand and body control. Gross motor skills advance every year as long as young children have space to play, older children to emulate, and freedom from environmental toxins. Sadly, crowding, fear of strangers, and pollution reduce the opportunities many contemporary children have to develop gross motor skills and may affect their overall learning, as well.

Young children also develop their fine motor skills, which prepares them for formal education. They love to dance, draw, and build, all encouraging the gradual mastery of arm and finger movements, which will be essential when they start to write. Gender differences, with girls ahead on average in fine motor skills and boys ahead in gross motor skills, may be biological or cultural.

WHAT HAVE YOU LEARNED?

1. What three factors help children develop their motor skills?
2. How have cohort changes affected the development of gross motor skills?
3. What is known and unknown about the effects on young children of chemicals in food, air, and water?
4. How does brain maturation affect children's artistic expression?
5. What are conflicting interpretations of gender differences in motor skills?

Injuries and Abuse

In almost all families of every income, ethnicity, and nation, parents want to protect their children while fostering their growth. Yet far more children die from violence—either accidental or deliberate—than from any specific disease.

The contrast between disease and accidental death is most obvious in developed nations, where medical prevention, diagnosis, and treatment make fatal illness rare until late adulthood. In the United States, four times as many 1- to 4-year-olds die of accidents than of cancer, which is the leading cause of disease death during these years (National Center for Health Statistics, 2013). Indeed, in 2010, more young U.S. children were murdered (385) than died of cancer (346). This was not always true, but cancer deaths have decreased over the past half century, while child homicide has increased.

Response for Immigrant Parents (from page 260): Children develop the motor skills that they see and practice. They will soon learn to use forks, spoons, and knives. Do not abandon chopsticks completely, because young children can learn several ways of doing things, and the ability to eat with chopsticks is a social asset.

Avoidable Injury

Worldwide, injuries cause millions of premature deaths among adults as well as children: Not until age 40 does any specific disease overtake accidents as a cause of mortality, and 14 percent of all life-years lost worldwide are caused by injury (World Health Organization, 2010).

In some nations, malnutrition, malaria, and other infectious diseases *combined* cause more infant and child deaths than injuries do, but those nations also have high rates of child injury. India, for example, has one of the highest rates worldwide of child motor-vehicle deaths; most children who die in such accidents are pedestrians (Naci et al., 2009). Everywhere, young children are at greater risk than slightly older ones. In the United States, 2- to 6-year-olds are more than twice as likely to be seriously hurt than 6- to 10-year-olds.

Age-Related Dangers

Why are young children so vulnerable? Some reasons have just been explained. Immaturity of the prefrontal cortex makes young children impulsive; they plunge into danger. Unlike infants, their motor skills allow them to run, leap, scramble, and grab in a flash, before a watching adult can stop them. Their curiosity is boundless; their impulses uninhibited. Then, if they do something that becomes dangerous, such as lighting a fire while playing with matches, fear and stress might make them slow to get help.

Age-related trends are apparent in particulars. Falls are more often fatal for the youngest (under 24 months) and oldest (over 80 years); preschoolers have high rates of poisoning and drowning; motor vehicle deaths peak from ages 15 to 25. Specific statistics reveal reasons for vulnerabilities. For instance, not only are 1- to 4-year-olds more likely to die of drowning than any other age group, they drown





Same Situation, Far Apart: Keeping Everyone Safe Preventing child accidents requires action by both adults and children. In the United States (*left*), adults passed laws and taught children—including this boy who buckles in his stuffed companion. In France (*right*), teachers stop cars while children hold hands to cross the street—each child keeping his or her partner moving ahead.

in swimming pools six times more often but in boating accidents only one-twelfth as often as older children and adults (MMWR, May 16, 2014). Usually the deadly swimming pool is in their own back yard, with their parents unaware that their preschooler was outside.

Injury Control

Instead of using the term *accident prevention,* public health experts prefer **injury control** (or **harm reduction**). Consider the implications. *Accident* implies that an injury is random, unpredictable; if anyone is at fault, it's a careless parent or an accident-prone child. This is called the "accident paradigm"—as if "injuries will occur despite our best efforts," allowing the public to feel blameless (Benjamin, 2004, p. 521).

Injury control suggests that the impact of an injury can be limited if appropriate controls are in place, and *harm reduction* implies that harm can be minimized. Minor mishaps (scratches and bruises) are bound to occur, but serious injury is unlikely if a child falls on a safety surface instead of on concrete, if a car seat protects the body in a crash, if a bicycle helmet cracks instead of a skull, or if swallowed pills come from a tiny bottle. Reducing harm from childhood behavior can be accomplished by a concerted effort of professionals and parents, as I know too well from my own experience described in the following A Case to Study.

injury control/harm reduction Practices that are aimed at anticipating, controlling, and preventing dangerous activities. These practices reflect the beliefs that accidents are not random and that injuries can be made less harmful if proper controls are in place.

a case to study

"My Baby Swallowed Poison"

The first strategy that most people think of to prevent injury to young children is to educate the parents. However, public health research finds that laws that apply to everyone are more effective than education, especially if parents are so overwhelmed by the daily demands of child care and money management that they do not realize they need to learn.

For example, infant car seats have saved thousands of lives. However, use of car seats is much less common when it is voluntary than when it is mandated. For that reason, car seats are now legally required.

Parents often consider safety a lower priority than everyday concerns. That explains two findings from the research: (1) The best time to convince parents to use a car seat is before they take their newborn home from the hospital, and (2) the best way to make sure a car seat is correctly used is to have an expert show the parents how it works—not simply tell them or make them watch a video (Tessier, 2010).

Motivation and education are crucial, yet in real life, everyone has moments of foolish indifference. Then automatic safety measures save lives (Damashek & Kuhn, 2014).

I know this firsthand. Our daughter Bethany, at age 2, climbed onto the kitchen counter to find, open, and swallow most of a bottle of baby aspirin. Where was I? In the next room, nursing our second child and watching television. I did not notice what Bethany was doing until I checked on her during a commercial.

Bethany is alive and well today, protected not by her foolish mother but by all three levels of prevention explained on the next page. Primary prevention included laws limiting the number of baby aspirin per container, secondary prevention included my pediatrician's written directions when Bethany was a week old to buy syrup of ipecac, and tertiary prevention was my phone call to Poison Control.

I told the helpful stranger who answered the phone, "My baby swallowed poison." He calmly asked me a few questions and then advised me to give Bethany ipecac to make her throw up. I did, and she did.

In retrospect, I realize I had bought that ipecac two years before, when I was a brand-new mother and ready to follow every word of my pediatrician's advice. I might not have done so if the doctor had waited until Bethany was able to climb before he recommended it, because by then I might have had more confidence in my own ability to prevent harm.

I still blame myself, but I am grateful for all three levels of prevention that protected my child. In some ways, my own education helped avert a tragedy. I had chosen a wise pediatrician; I knew the number for Poison Control (FYI: 1-800-222-1222). As I remember all the mistakes I made in parenting (only a few mentioned in this book), I am grateful for every level of prevention. Without protective laws and a national network to help parents, the results might have been tragic.

Less than half as many 1- to 5-year-olds in the United States were fatally injured in 2012 as in 1982, thanks to laws that limit poisons, prevent fires, and regulate cars. Control has not yet caught up with newer hazards, however. For instance, many homes in California, Florida, Texas, and Arizona now have swimming pools: In those states drowning is a leading cause of child death. One result: Although overall rates of accidental death increase as income falls, for pool drowning before age 5, rates of more affluent ethnic groups are higher than for poorer groups (MMWR, May 16, 2014).

Prevention

Prevention begins long before any particular child, parent, or legislator does something foolish. Unfortunately, no one notices injuries and deaths that did not happen. For developmentalists, two types of analysis are useful to predict danger and prevent it.

One is to look at all the systems that led to a serious injury. Causes can be found in the child, the microsystem, the exosystem, and the macrosystem, and thus measures can be taken to protect children in the future.

For example, when a child is hit by a car, it might be because the child was impulsive, the parents were neglectful (microsystem), the community was not child-friendly (no parks, traffic lights, sidewalks, or curbs—all exosystem), and/or because the culture valued fast cars over slow pedestrians (macrosystem). Once all those factors are recognized, preventive measures become clear, from holding the hand of young children when crossing the street all the way to national speed limits.

The second type of analysis involves understanding statistics. For example, the rate of childhood poisoning decreased markedly when pill manufacturers adopted bottles with safety caps that are difficult for children to open; such a statistic goes a long way in countering individual complaints about inconvenience. New statistics show a rise in the number of children being poisoned by taking adult recreational drugs, such as cocaine, alcohol, or marijuana, and that has led to new strategies for prevention (Fine et al., 2012).

Levels of Prevention

Three levels of prevention apply to every health and safety issue.

- In **primary prevention,** the overall situation is structured to make harm less likely. Primary prevention fosters conditions that reduce everyone's chance of injury.
- **Secondary prevention** is more specific, averting harm in high-risk situations or for vulnerable individuals.
- **Tertiary prevention** begins after an injury has already occurred, limiting damage.

primary prevention Actions that change overall background conditions to prevent harm.

secondary prevention Actions that avert harm in a high-risk situation, such as holding a child's hand while crossing the street.

tertiary prevention Actions, such as immediate and effective medical treatment, that reduce harm or prevent disability after injury.

In general, tertiary prevention is the most visible of the three levels, but primary prevention is the most effective (Cohen et al., 2010). An example comes from data on pedestrian deaths. As compared with 20 years ago, fewer children in the United States today die after being hit by a motor vehicle (see Figure 8.5). How does each level of prevention contribute?

Primary prevention includes sidewalks, pedestrian overpasses, streetlights, and traffic circles. Cars have been redesigned (e.g., better headlights, windows, and brakes), and drivers' competence has improved (e.g., stronger penalties keep many drunk drivers off the road). Reduction of traffic via improved mass transit provides additional primary prevention.

Especially for Urban Planners Describe a neighborhood park that would benefit 2- to 5-year-olds. (see response, page 266)

Secondary prevention reduces danger in high-risk situations. School crossing guards and flashing lights on stopped school buses are secondary prevention, as

are salt on icy roads, warning signs before blind curves, speed bumps, and walk/don't walk signals at busy intersections.

Finally, *tertiary prevention* reduces damage after an accident. Examples include laws against hit-and-run drivers, speedy ambulances, efficient emergency room procedures, and effective follow-up care, all of which have been improved from decades ago.

Medical personnel speak of the *golden hour*, the hour following an accident, when a victim should be treated. Of course, there is nothing magical about 60 minutes in contrast to 61 minutes, but the faster an injury victim reaches a trauma center, the better the chance of survival (Dinh et al., 2013).

Culture and Injury Prevention: Baby on the Plane

I once was the director of a small preschool. I was struck by the diversity of fears and prevention measures, some helpful and some not. Some parents were thrilled that our children painted, but others worried about the ingredients of the paint, for instance. We had an outdoor sandbox; some parents thought that could give the children worms.

I knew that all children need to grab, run, and explore to develop their motor skills as well as their minds, yet they also need to be prevented from falling down stairs, eating pebbles, or running into the street—as many are inclined to do. That meant that teachers needed to balance freedom and prohibition. Yet the specifics of that balance are understood differently by various cultures.

Adults do not agree on the best strategies to prevent injury. Consider what one mother wrote about her flight from Australia to California:

> I travelled with my 10-month-old daughter and was absolutely and thoroughly disappointed in the treatment we received from the flight crew captain at the time. I was told or more like instructed that I was to "restrain" my child for the whole flight, which was 13 hours.
>
> I said that other people were able to move around the plane freely, why wasn't she? I was told that due to turbulence she would have to be restrained for the whole trip. On several occasions the flight crew captain would make a point of going out of his way to almost scold me for not listening to him when I would put her down to crawl around.
>
> *[Retrieved April 3, 2011, from Complaints.com]*

This same mother praised her treatment on other long flights, specifically on Asian airlines, when her child was allowed to move more freely and the crew was helpful. Which culture is better at protecting children without needlessly restraining them?

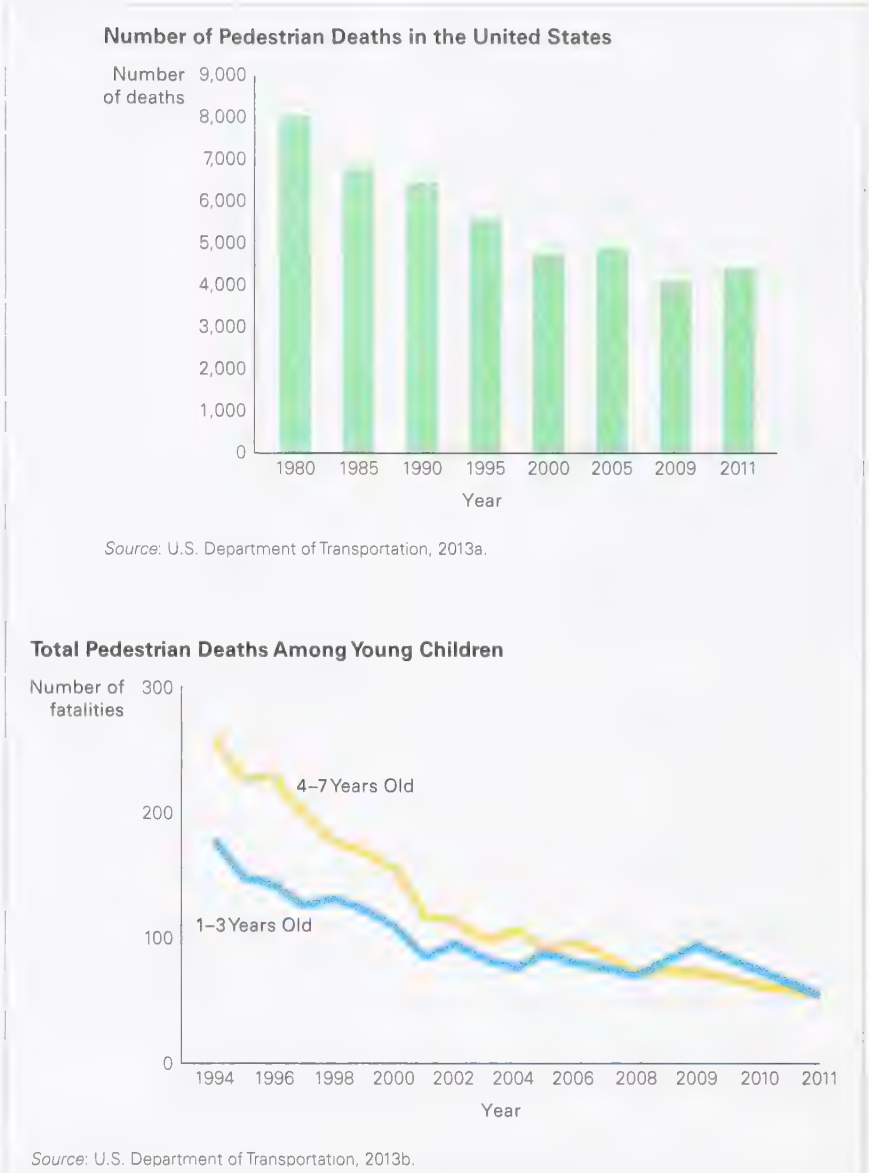


FIGURE 8.5

While the Population Grew This chart shows dramatic evidence that prevention measures are succeeding in the United States. Over the same time period, the total population has increased by about one-third, making these results even more impressive.

Response for Urban Planners (from page 264): The adult idea of a park—a large, grassy, open place—is not best for young children. For them, you would design an enclosed area, small enough and with adequate seating to allow caregivers to socialize while watching their children. The playground surface would have to be protective (since young children are clumsy), with equipment that encourages motor skills. Teenagers and dogs should have their own designated area, far from the youngest children.

My sympathies were with the mother, and I praised the Asian crews, until I read this response:

> Consider the laws in the U.S. regarding child safety in an automobile. Nobody thinks a child should be free to crawl around in a car. No parent thinks their rights have been violated because their child is prevented from free flight inside a car when it impacts. Why not just put the child in the bed of a truck and drive around? . . . Her child could get stepped on, slammed against a seat leg, wedged under a seat, fallen on, etc.
>
> *[Retrieved April 3, 2011, from Complaints.com]*

Both sides in this dispute make sense, yet both cannot be right. The data prove that safety seats in cars save lives, but "impact" in planes is unlike that in a car crash. Statistical analysis is needed, or at least studies of injured children on airplanes, considering all the systems involved. Do passengers on planes step on crawling children? If so, is that controllable harm or a serious hazard?

SUMMING UP Worldwide, young children are more likely to be seriously hurt or killed accidently than they are to suffer from any specific disease. However, most such harm can prevented, which is why developmentalists prefer the term "injury control" rather than "accident prevention." The contrast between death from disease and death from unintentional injury is particularly stark in the United States. Nonetheless, rates of such deaths have fallen since prevention is better understood. Three levels of prevention are crucial: primary (in the entire culture), secondary (for high-risk situations), and tertiary (after the injury, to reduce the harm).

WHAT HAVE YOU LEARNED?

1. What can be concluded from the data on rates of childhood injury?
2. How do injury deaths compare in developed and developing nations?
3. What are some examples of primary prevention?
4. What are some examples of secondary prevention?
5. Why and how do cultures differ in determining acceptable risk?

Especially for Criminal Justice Professionals Over the past decade, the rate of sexual abuse has gone down by almost 20 percent. What are three possible explanations? (see response, page 268)

Child Maltreatment

Until about 1960, people thought child maltreatment was rare and consisted of a sudden attack by a disturbed stranger. Today we know better, thanks to a careful observation in one Boston hospital (Kempe & Kempe, 1978).

Maltreatment is neither rare nor sudden, and 82 percent of the time the perpetrators are the child's parents (U.S. Department of Health and Human Services, 2013, December). That makes it much worse: Ongoing maltreatment, with no protector, is much more damaging than a single incident, however injurious.

child maltreatment Intentional harm to, or avoidable endangerment of, anyone under 18 years of age.

child abuse Deliberate action that impairs a child's physical, emotional, or sexual well-being.

child neglect Failure to meet a child's basic physical, educational, or emotional needs.

Definitions and Statistics

Child maltreatment now refers to all intentional harm to, or avoidable endangerment of, anyone under 18 years of age. Thus, child maltreatment includes both **child abuse,** which is deliberate action that is harmful to a child's physical, emotional, or sexual well-being, and **child neglect,** which is failure to meet essential physical or emotional needs. Neglect may be worse than abuse. It also is "the most common and most frequently fatal form of child maltreatment" (Proctor & Dubowitz, 2014, p. 27). About three times as many neglect as abuse cases occur in the United States, a ratio probably found in many other nations.

To be specific, data on cases of *substantiated* maltreatment in the United States in 2012 indicate that 78 percent were cases of neglect, 18 percent of physical abuse, and 9 percent of sexual abuse. (A few were tallied in two categories) (U.S. Department of Health and Human Services, 2013, December). Yet neglect is too often ignored by the public, who are "stuck in an overwhelming and debilitating" concept of maltreatment that focuses only on immediate bodily harm (Kendall-Taylor et al., 2014, p. 810).

Substantiated maltreatment means that a case has been reported, investigated, and verified (see Figure 8.6). In 2012, almost 700,000 children suffered substantiated abuse in the United States. Substantiated maltreatment harms about 1 in every 90 children aged 2 to 5 annually.

Reported maltreatment means simply that the authorities have been informed. Since 1993, the number of children *reported* as maltreated in the United States has ranged from about 2.7 million to 3.6 million per year, with 3.2 million in 2012 (U.S. Department of Health and Human Services, 2013, December).

The 4.5-to-1 ratio of reported versus substantiated cases occurs because:

1. Each child is counted only once, so five verified reports about a single child result in one substantiated case.
2. Substantiation requires proof. Not every investigation finds unmistakable harm or a witness willing to testify. Sometimes reports provide too little information, and the child cannot be located.
3. Many professionals are *mandated reporters*, required to report any signs of possible maltreatment. Often signs could be maltreatment, but investigation finds that no harm occurred (Pietrantonio et al., 2013).
4. Some reports are "screened out," which means that the agency decides the case does not come under their jurisdiction, such as when a case belongs under the jurisdiction of the military or of a Native American tribe (who have their own systems).
5. A report may be false or deliberately misleading (though few are) (Sedlak & Ellis, 2014).

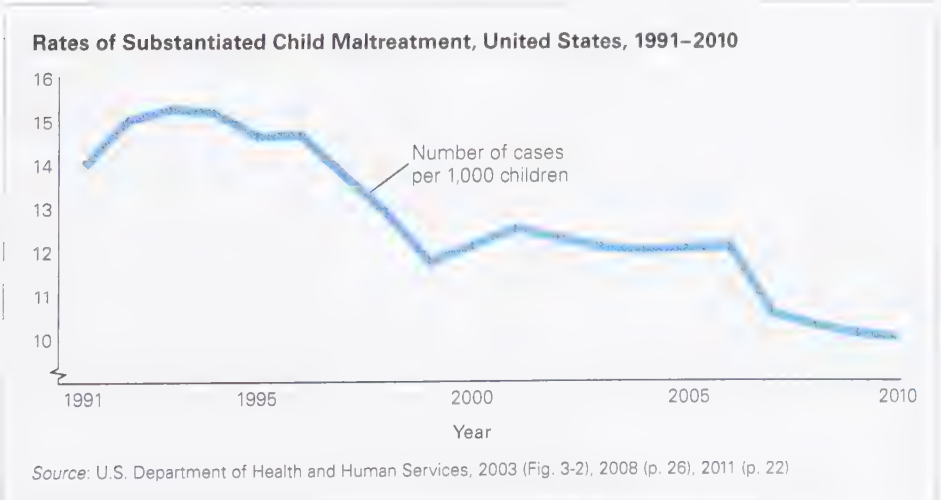


CHRISTOPHER SADOWSKI/SPLASH NEWS/NEWSCOM

Abuse Victim? Fair-skinned Anna, age 5, told the school nurse she was sunburned because her mommy, Patricia, took her to a tanning salon. Patricia said Anna was gardening in the sun; Anna's father and brother (shown here) said all three waited outside the salon while Patricia tanned inside. The story led to an arrest for child endangerment, a court trial, and a media frenzy. Was the media abusive, the nurse intrusive, or the opposite? If your child is sunburned, is it your fault?

substantiated maltreatment Harm or endangerment that has been reported, investigated, and verified.

reported maltreatment Harm or endangerment about which someone has notified the authorities.



OBSERVATION QUIZ The data point for 2010 is close to the bottom of the graph. Does that mean it is close to zero? (see answer, page 269)

FIGURE 8.6

Still Far Too Many The number of substantiated cases of maltreatment of children under age 18 in the United States is too high, but there is some good news: The rate has declined significantly from its peak in 1993.

Especially for Nurses While weighing a 4-year-old, you notice several bruises on the child's legs. When you ask about them, the child says nothing and the parent says the child bumps into things. What should you do? (see response, page 270)

OBSERVATION QUIZ Have all types of maltreatment declined since 2000? (see answer, page 270)

Frequency of Maltreatment

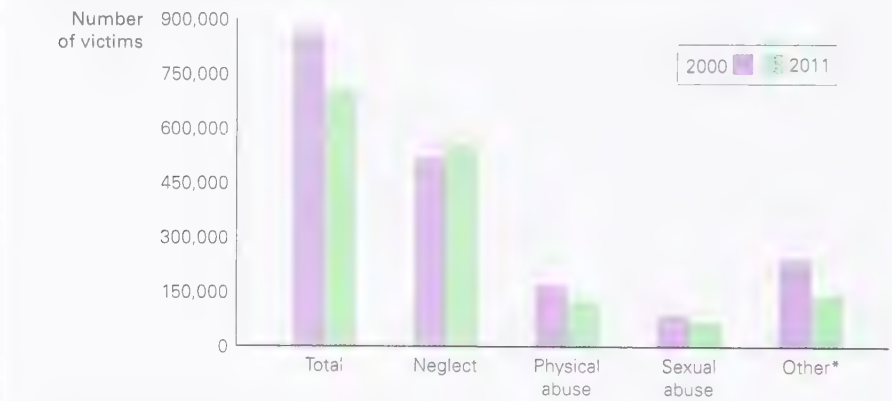
How often does maltreatment actually occur? No one knows. Not all cases are noticed, not all that are noticed are reported, and not all reports are substantiated. Part of the problem is drawing the line between harsh discipline and abuse, and between momentary and ongoing neglect. Similar issues apply in every nation, city, and town, with marked variations in reports and confirmations. In general, only the most severe cases are tallied.

If we rely on official U.S. statistics, trends are apparent. Officially, substantiated child maltreatment increased from about 1960 to 1990 but decreased thereafter (see Figure 8.7). Physical and sexual abuse declined, but neglect did not. Other sources also report declines, particularly in sexual abuse, over the past two decades. That seems to be good news; perhaps national awareness has led to better reporting and then better prevention.

FIGURE 8.7

Getting Better? As you can see, the number of victims of child maltreatment in the United States has declined in the past decade. The legal and social-work responses to serious maltreatment have improved over the years, which is a likely explanation for the decline. Other, less sanguine explanations are possible, however.

Substantiated Child Maltreatment in the United States, 2000 and 2011



* *Other* includes emotional and medical abuse, educational neglect, and maltreatment not specified by the state records.

Source: U.S. Department of Health and Human Services, 2003, 2012

// Response for Criminal Justice Professionals (from page 266): Hopefully, more adults or children are aware of sexual abuse and stop it before it starts. A second possibility is that sexual abuse is less often reported and substantiated because the culture is more accepting of teenage sex (most victims of sexual abuse are between ages 10 and 18). A third possible explanation is that the increase in the number of single mothers means that fathers have less access to children (fathers are the most frequent sexual abusers).

Accuracy of State Data

Unfortunately, official reports leave room for doubt. For example, Pennsylvania reports fewer victims of child maltreatment than Maine (3,416 compared to 3,781 in 2010), but the child population of Pennsylvania is ten times that of Maine. Why? It's not lack of personnel: Pennsylvania has twenty times as many professionals screening and investigating (2831 to 145). Maybe it's the definition of maltreatment: Less than 10 percent of the Pennsylvania victims are said to be neglected, but 66 percent are considered victims of sexual abuse, although nationwide only 9 percent of maltreated children are. Does that mean that the Pennsylvania laws ignore most children who would be considered victims if they lived in another state? Or are the overworked investigators in Maine too quick to confirm maltreatment?

How maltreatment is defined and whether or not it is reported is powerfully influenced by culture (one of my students asked, "When is a child too old to be beaten?") and by personal willingness to report. The United States has become more culturally diverse; could that be why reports are down?

For developmentalists, a particular problem is that maltreatment is most common early in life, when children are too young to be required to go to school (where teachers would notice a problem) and too young to ask for help. In fact, infants have the highest rates of maltreatment, and 28 percent of all cases occur during

early childhood (U.S. Department of Health and Human Services, 2013, December). Those are reported and substantiated cases; probably many more never reach outsiders' attention.

Warning Signs

Instead of relying just on official statistics, every reader of this book can recognize developmental problems. Often the first sign of maltreatment is delayed development, such as slow growth, immature communication, lack of curiosity, or unusual social interactions. All these difficulties may be evident even at age 1, when they could be noticed by a relative or a neighbor. Unfortunately, many people do not know what is normal for infants (crying, clinging, smiling) and what is not (fear of caregiver, gaining less than a pound a month).

By early childhood, maltreated children may seem fearful, startled by noise, defensive and quick to attack, and confused between fantasy and reality. These are symptoms of **post-traumatic stress disorder (PTSD).** PTSD was first identified in combat veterans, then in adults who had experienced some emotional injury or shock (after a serious accident, natural disaster, or violent crime), and more recently in some maltreated children, who suffer neurologically, emotionally, and behaviorally (Neigh et al., 2009; Weiss et al., 2013).

Table 8.1 lists signs of child maltreatment, both neglect and abuse. None of these signs is *proof* of abuse, but whenever any of them occurs, something is amiss.

post-traumatic stress disorder (PTSD) An anxiety disorder that develops after a profoundly shocking or frightening event, such as rape, severe beating, war, or natural disaster. Symptoms may include flashbacks to the event, hyperactivity and hypervigilance, displaced anger, sleeplessness, nightmares, sudden terror or anxiety, and confusion between fantasy and reality.

Consequences of Maltreatment

The consequences of maltreatment involve not only the child but also the entire community. Regarding specifics, much depends on the community culture.

Customs and Maltreatment

The impact of any child-rearing practice is affected by the cultural context. Certain customs (such as circumcision, pierced ears, and spanking) are considered abusive among some groups but not in others; their effects vary accordingly. Children suffer if their parents seem to love them less than most parents in their

TABLE 8.1 Signs of Maltreatment in Children Aged 2 to 10

Injuries that are unlikely to be accidents, such as bruises on both sides of the face or body; burns with a clear line between burned and unburned skin
Repeated injuries, especially broken bones not properly tended (visible on X-ray)
Fantasy play, with dominant themes of violence or sex
Slow physical growth
Unusual appetite or lack of appetite
Ongoing physical complaints, such as stomachaches, headaches, genital pain, sleepiness
Reluctance to talk, play, or move, especially if development is slow
No close friendships; hostility toward others; bullying of smaller children
Hypervigilance, with quick, impulsive reactions, such as cringing, startling, or hitting
Frequent absence from school
Frequent change of address
Frequent change in caregivers
Fearfulness, rather than joy, on seeing caregiver

ANSWER TO OBSERVATION QUIZ (from page 267): No. The number is actually 10.0 per 1,000. Note the little squiggle on the graph's vertical axis below the number 10. This means that numbers between 0 and 9 are not shown.

Response for Nurses (from page 268): Any suspicion of child maltreatment must be reported, and these bruises are suspicious. Someone in authority must find out what is happening so that the parent as well as the child can be helped.

ANSWER TO OBSERVATION QUIZ (from page 268) Most types of abuse are declining, but not neglect. This kind of maltreatment may be the most harmful because the psychological wounds last for decades.

neighborhood. If parents forbid something most other children have (from candy to cell phones) or punishes more severely or not at all, a child might feel unloved.

However, although culture is always relevant, the impact of maltreatment is multifaceted and long-lasting. The effects on adults of past maltreatment depend partly on the current relationship between the adult and the parent. If they manage to have a good relationship (more common if abuse was not chronic), then effects are less pervasive because the adult feels loved despite the mistreatment (Schafer et al., 2014).

Body and Brain

Developmentalists realize that the consequences of maltreatment include much more than the immediate harm. The biological and academic impairment resulting from maltreatment is obvious, as when a child is bruised, broken, afraid to talk, or failing in school.

However, when researchers follow maltreated children over the years, deficits in social skills seem more crippling than physical or intellectual damage. Maltreated children tend to hate themselves and then hate everyone else. Even if the child was mistreated early on and then not after age 5, emotional problems (externalizing for the boys and internalizing for the girls) linger (Godinet et al., 2014). The effects (drug abuse, social isolation, poor health) of maltreatment are still evident in adulthood (Sperry & Widom, 2013; Mersky et al., 2013).

Hate is corrosive. A warm and enduring friendship might repair some damage, but maltreatment makes friendship unlikely. Many studies have found that mistreated children typically regard other people as hostile and exploitative; hence, they are less friendly, more aggressive, and more isolated than other children. The earlier abuse starts and the longer it continues, the worse their relationships are, with physically and sexually abused children likely to be irrationally angry and neglected children often withdrawn (Petrenko et al., 2013).

Finding and keeping a job is a critical aspect of adult well-being, yet adults who were maltreated suffer in this way as well. One study carefully matched 807 children who had experienced substantiated abuse with other children who were of the same sex, ethnicity, and family SES. About 35 years later, long after maltreatment had stopped, those who had been mistreated were 14 percent less likely to be employed than those who had not been abused. The researchers concluded: "abused and neglected children experience large and enduring economic consequences" (Currie & Widom, 2010, p. 111). In this study, women were more impaired than men: It may be that self-esteem, emotional stability, and social skills are even more important for female than for male workers.

This study is just one of hundreds of longitudinal studies, all of which find that maltreatment affects people decades after broken bones, or skinny bodies, or medical neglect disappear. To protect the health of the entire society in the future, prevention of child maltreatment is crucial.

Prevention

To halt child abuse and neglect, many measures of prevention are needed. Changes in the entire culture may be the most effective, but they also are the most difficult to implement.

Three Levels of Prevention

Just as with injury control, the ultimate goal with regard to child maltreatment is *primary prevention*, a social network of customs and supports that make parents,

neighbors, and professionals protect every child. Neighborhood stability, parental education, income support, and fewer unwanted children all reduce maltreatment.

Secondary prevention involves spotting warning signs and intervening to keep a risky situation from getting worse. For example, insecure attachment, especially of the disorganized type, is a sign of a disrupted parent–child relationship, which is a risk factor for maltreatment. Many researchers have found ways to repair insecure attachment before it becomes harmful. (**Developmental Link:** Attachment types are explained in detail in Chapter 7.) Critics argue that primary prevention is more effective in the long run, but projects are more likely to be funded and implemented if they focus on high-risk families (Nelson & Caplan, 2014).

An important aspect of secondary prevention is reporting the first signs of maltreatment so that families can be helped before a child is damaged for life. Every parent and child interacts with several other people, who can notice signs of normal and abnormal development.

Some people are *mandated reporters,* professionals who are legally required to report signs of abuse. Together, they provide more than half of all reports in the United States; teachers and law enforcement personnel each provide about 17 percent of reports (U.S. Department of Health and Human Services, 2013, December). It is not their responsibility to be certain that abuse has occurred; that is the job of social workers who, as already mentioned, investigate.

Sometimes reports come from neighbors (5 percent) or relatives (7 percent). You might wonder why more lay people do not report abuse. One reason is ignorance: Many abusers deliberately change residences and break off contact with relatives. That in itself is a sign of trouble. Another reason is that people fear the anger of the abuser or worry that the officials will makes things worse.

Tertiary prevention limits harm after maltreatment has occurred. Reporting and substantiating abuse are the first steps. Often the caregiver needs help in providing better care. Sometimes the child needs another home.

Permanency Planning

All levels of prevention require helping caregivers provide a safe, nurturing, and stable home. This is true for biological parents, a foster family, or an adoptive family. Whenever a child is removed from an abusive or neglectful home, **permanency planning** is needed: That means that plans need to be made to nurture the child until adulthood—either by supporting the original family or finding another home (Scott et al., 2013).

permanency planning An effort by child-welfare authorities to find a long-term living situation that will provide stability and support for a maltreated child. A goal is to avoid repeated changes of caregiver or school, which can be harmful to the child.



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Family Protection Relatives are a safety net. Ideally, they feed and play with the young members of the family (as these grandfathers do). This is secondary prevention, allowing parents to provide good care. Rarely tertiary prevention is needed. About 2 percent of all U.S. grandparents are foster or adoptive parents of their grandchildren. This does not benefit the adults, but it may be the best solution for mistreated children.

foster care A legal, publicly supported system in which a maltreated child is removed from the parents' custody and entrusted to another adult or family. Foster care providers are reimbursed for expenses incurred in meeting the child's needs.

kinship care A form of foster care in which a relative of a maltreated child, usually a grandparent, becomes the approved caregiver.

In **foster care,** children are officially taken from their parents and entrusted to another adult or family; foster parents are reimbursed for the expenses they incur in meeting the children's needs. In every year from 2000 to 2014, almost half a million children in the United States were in foster care. Many of them were in a special version of foster care called **kinship care,** in which a relative—usually a grandmother—becomes the caregiver. This estimate is for official kinship care; three times as many children are unofficially cared for by relatives.

In every nation, most foster children are from low-income, ethnic-minority families—a statistic that reveals problems in the macrosystem as well as the microsystem. In the United States, children in foster care often have experienced severe maltreatment and have multiple physical, intellectual, and emotional problems (Jones & Morris, 2012). Most develop better in foster care (including kinship care) than with their original abusive families if a supervising agency provides ongoing financial support and counseling (Oosterman et al., 2007).

Adequate support is not typical, however. One obvious failing is that many children move from one foster home to another for reasons that are unrelated to the child's behavior or wishes (Jones & Morris, 2012). Each move increases the risk of a poor outcome. Another problem is that kinship care is sometimes used as an easy, less expensive solution.

Supportive services are especially needed in kinship care, since the grandparent typically lives in the same community of poverty, racism, and/or violence that contributed to the original problems. All of this affects the foster child as well (Hong et al., 2011).

Most adults, even in the most troubled communities, want success for children and do their best to provide it. Many adults raised by grandparents fare well, but grandparents need even more help from friends, relatives, and agencies than parents, yet they are less likely to get it.

adoption A legal proceeding in which an adult or couple is granted the joys and obligations of being a child's parent(s).

Adoptive Homes

Adoption (when an adult or couple is legally granted parenthood) is the best permanent option when a child should not be returned to a parent (Scott et al., 2013).



Mother–Daughter Love, Finally After a difficult childhood, 7-year-old Alexia is now safe and happy in her mother's arms. Maria Luz Martinez was her foster parent and has now become her adoptive mother.

However, adoption is difficult for many reasons, including the following:

- Judges and biological parents are reluctant to release children for adoption.
- Most adoptive parents prefer infants, so it is harder to find adoptive homes for older children.
- Some agencies screen out families not headed by a heterosexual married couple.
- Some professionals insist that adoptive parents be of the same ethnicity and religion as the child.
- Kinship caregivers are reluctant to sever the parental rights of their child or other relative.

As detailed many times in this chapter, caring for young children is not easy, whether it involves making them brush their teeth or keeping them safe from harm. Parents shoulder most of the burden, and their love and protection usually result in strong and happy children. Beyond the microsystem, however, complications abound. Adults are failing many young children, as statistics throughout this chapter reveal. The entire community benefits from well-nurtured children; how to achieve that goal is the question we all must answer.

SUMMING UP Although abuse seems to have decreased in the United States as more of the public has become aware of it, still about 700,000 children are tallied each year as maltreated—more often neglected than abused. Maltreatment has lifelong consequences. Neglect is often worse than abuse, as social and emotional deficits are harder to remedy than physical harm.

In primary prevention, laws and customs need to protect every child, with measures to reduce poverty, to strengthen families, and to nurture all children. In secondary prevention, supervision, forethought, and protective care can prevent harm to those at risk, with signs of neglect and abuse apparent in the first months of life, and obvious by early childhood. In tertiary prevention, quick and effective medical and psychosocial intervention is needed when injury or maltreatment occurs. Foster care and adoption are sometimes best for children, but these options are not as available as they need to be. Putting an end to maltreatment of all kinds is urgent, but this goal is difficult to achieve because changes are needed in families, cultures, communities, and laws.

WHAT HAVE YOU LEARNED?

1. Why did few people recognize childhood maltreatment 50 years ago?
2. Why is neglect in childhood considered more harmful than abuse in the long term?
3. Why is it difficult to know exactly how often child maltreatment occurs?
4. What are the common signs that indicate a child may be maltreated?
5. What are the long-term consequences of childhood maltreatment?
6. What are the advantages and disadvantages of foster care?
7. Why does permanency planning rarely result in adoption?

SUMMARY

Body Changes

1. Well-nourished children continue to gain weight and add height during early childhood. Unfortunately, however, many adults overfeed children, not realizing that young children are naturally quite thin.
2. Culture, income, and family customs all affect children's growth. In contrast to past decades, children of low-income families are twice as likely to be overweight as their wealthier counterparts. Worldwide, an increasing number of children are eating too much, which puts them at risk for multiple health problems and diseases.
3. Many young children consume too much sugar and too little calcium and other nutrients. One consequence is poor oral health. Children need to brush their teeth and visit the dentist years before their permanent teeth erupt.

Brain Development

4. The brain continues to grow in early childhood, reaching 75 percent of its adult weight at age 2 and 90 percent by age 6. Lateralization helps the brain specialize and allows left-right coordination.
5. During early childhood myelination is substantial and speeds transmission of messages from one part of the brain to another; the corpus callosum becomes thicker and functions much more effectively; and the prefrontal cortex, known as the executive of the brain, is strengthened as well.
6. Brain changes enable more reflective, coordinated thought and memory, better planning, and quicker responses. Left–right specialization is apparent in the brain as well as in the body, although the entire brain and the entire body work together to perform most skills.
7. The expression and regulation of emotions are fostered by several brain areas, including the amygdala, the hippocampus, and the hypothalamus. Childhood trauma may create a flood of stress hormones (especially cortisol) that damage the brain and interfere with learning. However, some stress aids learning if reassurance is also present.

Improving Motor Skills

8. Gross motor skills continue to develop; clumsy 2-year-olds become 6-year-olds who move their bodies well, guided by their peers, practice, motivation, and opportunity—all of which vary by culture. Children's main activity is play. Playing with other children in safe places helps develop skills that benefit children's physical, intellectual, and social development.
9. Urbanization and chemical pollutants are two factors that hamper development. More research is needed, but it is already apparent that high lead levels in the blood can impair the brain.
10. Fine motor skills are difficult to master during early childhood. Young children enjoy expressing themselves artistically, which helps them develop their body and finger control. Fortunately, self-criticism is not yet strong.

Injuries and Abuse

11. Accidents cause more child deaths than diseases in early childhood, with young children more likely to suffer a serious injury or premature death than older children. Close supervision and public safeguards can protect young children from their own eager, impulsive curiosity.
12. In the United States, various preventive measures have reduced the rate of serious injury, but medical measures have reduced disease deaths even faster. Four times as many young children die of injuries than of the leading cause of disease death.
13. Injury control occurs on many levels, including long before and immediately after each harmful incident. Primary prevention protects everyone, secondary prevention focuses on high-risk conditions and people, and tertiary prevention occurs after an injury. All are needed.

Child Maltreatment

14. Child maltreatment includes ongoing abuse and neglect, usually by a child's own parents. Each year, about 3 million cases of child maltreatment are reported in the United States; about 700,000 of these are substantiated. Rates have been decreasing in recent years.
15. Physical abuse is the most obvious form of maltreatment, but neglect is more common and more harmful. Health, learning, and social skills are all impeded by abuse and neglect, not only during childhood but also decades later.
16. Tertiary prevention may include placement of a child in foster care, including kinship care. In any case, families, whether biological or foster, need supportive services to prevent maltreatment.
17. Permanency planning is required because frequent changes of home environment are harmful to children. Adoption is much less common than returning the child to the biological parents, although adoption is a permanent solution that may be the best solution for the child.

KEY TERMS

myelination (p. 246)
corpus callosum (p. 247)
lateralization (p. 247)
impulse control (p. 249)
perseveration (p. 249)
amygdala (p. 251)
hippocampus (p. 251)
hypothalamus (p. 251)
injury control/harm reduction (p. 263)
primary prevention (p. 264)
secondary prevention (p. 264)
tertiary prevention (p. 264)
child maltreatment (p. 266)
child abuse (p. 266)
child neglect (p. 266)
substantiated maltreatment (p. 267)
reported maltreatment (p. 267)
post-traumatic stress disorder (PTSD) (p. 269)
permanency planning (p. 271)
foster care (p. 272)
kinship care (p. 272)
adoption (p. 272)

APPLICATIONS

1. Keep a food diary for 24 hours, writing down what you eat, how much, when, how, and why. Then think about nutrition and eating habits in early childhood. Do you see any evidence in yourself of imbalance (e.g., not enough fruits and vegetables, too much sugar or fat, eating when you are not really hungry)? Did your food habits originate in early childhood, in adolescence, or at some other time?
2. Go to a playground or other place where young children play. Note the motor skills that the children demonstrate, including abilities and inabilities, and keep track of age and gender. What differences do you see among the children?
3. Ask several parents to describe each accidental injury of each of their children, particularly how it happened and what the consequences were. What primary, secondary, or tertiary prevention measures would have made a difference?
4. Think back to your childhood and the children you knew at that time. Was there any maltreatment? Considering what you have learned in this chapter, why or why not?



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CHAPTER 9

Early Childhood: Cognitive Development



What Will You Know?

1. Are young children selfish or just self-centered?
2. Do children get confused if they hear two languages?
3. Is preschool for play or learning?

- Thinking During Early Childhood
  - Piaget: Preoperational Thought
  - A CASE TO STUDY: Stones in the Belly
  - Vygotsky: Social Learning
  - Children's Theories
  - A VIEW FROM SCIENCE: Witness to a Crime
  - Brain and Context
- Language Learning
  - A Sensitive Time
  - The Vocabulary Explosion
  - Acquiring Grammar
  - Learning Two Languages
- Early-Childhood Schooling
  - Homes and Schools
  - Child-Centered Programs
  - Teacher-Directed Programs
  - Preparing for School
  - Long-Term Gains from Intensive Programs

Asa, not yet 3 feet tall, held a large rubber ball. He wanted me to play basketball with him.

"We can't play basketball; we don't have a hoop," I said.

"We can imagine a hoop," he answered, throwing up the ball.

"I got it in," he said happily. "You try."

I did.

"You got it in, too," he announced and did a little dance.

Soon I was tired and sat down.

"I want to sit and think my thoughts," I told him.

"Get up," he urged. "You can play basketball and think your thoughts."

Asa is typical. Imagination comes easily to him, and he aspires to the skills of older, taller people in his culture. He thinks by doing, and his vocabulary is impressive, but he does not yet understand that my feelings differ from his, that I would rather sit than throw a ball at an imaginary basket. He does know, however, that I usually respond to his requests.

This chapter describes these characteristics of the young child—imagination, active learning, vocabulary, and some difficulty understanding another person's perspective. I hope it also conveys the joy of understanding the thinking of young children. When that happens, you might do what I did: Get up and play.

Thinking During Early Childhood

You have just learned in Chapter 8 that every year of early childhood advances motor skills, brain development, and impulse control. In Chapter 6, you learned about the impressive development of memory and language in the first two years of life. Each of these developmental advances affects cognition. Thinking during early childhood is multi-faceted, creative, and remarkable.

Piaget: Preoperational Thought

Early childhood is the time of **preoperational intelligence,** the second of Piaget's four periods of cognitive development (described in Table 2.3 on p. 49). He called

preoperational intelligence Piaget's term for cognitive development between the ages of about 2 and 6; it includes language and imagination (which involve symbolic thought), but logical, operational thinking is not yet possible at this stage.

early-childhood thinking *pre*operational because children do not yet use logical operations (reasoning processes) (Inhelder & Piaget, 1964/2013).

Preoperational children are no longer in the stage of sensorimotor intelligence because they can think in symbols, not just via senses and motor skills. In **symbolic thought,** an object or word can stand for something else, including something out of sight or imagined. Language is the most apparent example of symbolic thought, because using words makes it possible to think about many more things at once. However, although vocabulary and imagination can soar in early childhood, logical connections between ideas are not yet active, not yet *operational*.

symbolic thought A major accomplishment of preoperational intelligence that allows a child to think symbolically, including understanding that words can refer to things not seen and that an item, such as a flag, can symbolize something else (in this case, a country).

The word *dog,* for instance, is at first only the family dog sniffing at the child, not yet a symbol (Callaghan, 2013). By age 2, the word becomes a symbol: It can refer to a remembered dog, or a plastic dog, or an imagined dog. Symbolic thought allows for the language explosion (detailed later in this chapter), which enables children to talk about thoughts and memories. However, since thought during these years is *pre*operational, it is hard for young children to understand the historical connections, similarities, and differences between dogs and wolves, or even between a Labrador retriever and a poodle.

Can Fish Talk? Of course they can. As every preschooler who watches Finding Nemo knows, some fish talk and help each other, just like egocentric children do.



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Symbolic thought helps explain **animism,** the belief of many young children that natural objects (such as a tree or a cloud) are alive and that nonhuman animals have the same characteristics as the child.

Many children's stories include animals or objects that talk and listen (Aesop's fables, *Winnie-the-Pooh, Goodnight Moon, The Day the Crayons Quit*). Preoperational thought is symbolic and magical, not logical and realistic. Childish animism gradually disappears with maturation (Kesselring & Müller, 2011).

Obstacles to Logic

Piaget described symbolic thought as characteristic of preoperational thought. He noted four limitations that make logic difficult until about age 6: centration, focus on appearance, static reasoning, and irreversibility.

animism The belief that natural objects and phenomena are alive.

centration A characteristic of preoperational thought in which a young child focuses (centers) on one idea, excluding all others.

egocentrism Piaget's term for children's tendency to think about the world entirely from their own personal perspective.

focus on appearance A characteristic of preoperational thought in which a young child ignores all attributes that are not apparent.

static reasoning A characteristic of preoperational thought in which a young child thinks that nothing changes. Whatever is now has always been and always will be

Centration is the tendency to focus on one aspect of a situation to the exclusion of all others. Young children may, for example, insist that Daddy is a father, not a brother, because they center on the role that he fills for them. The daddy example illustrates a particular type of centration that Piaget called **egocentrism**—literally, "self-centeredness." Egocentric children contemplate the world exclusively from their personal perspective.

Egocentrism is not selfishness. One 3-year-old chose to buy a model car as a birthday present for his mother: His "behavior was not selfish or greedy; he carefully wrapped the present and gave it to his mother with an expression that clearly showed that he expected her to love it" (Crain, 2005, p. 108).

A second characteristic of preoperational thought is a **focus on appearance** to the exclusion of other attributes. For instance, a girl given a short haircut might worry that she has turned into a boy. In preoperational thought, a thing is whatever it appears to be—evident in the joy young children have in wearing the hats or shoes of a grown-up, clomping noisily and unsteadily around the living room.

Third, preoperational children use **static reasoning.** They believe that the world is stable, unchanging, always in the state in which they currently encounter it.

Many children cannot imagine that their own parents were ever children. If they are told that Grandma is their mother's mother, they still do not understand how people change with maturation.

One preschooler wanted his grandmother to tell his mother to never spank him because "she has to do what her mother says." Often a preschooler whose baby brother or sister sucks a bottle wants a bottle, too. The answer, "You had a bottle when you were little, now you are a big kid," is not convincing.

The fourth characteristic of preoperational thought is **irreversibility.** Preoperational thinkers fail to recognize that reversing a process sometimes restores whatever existed before. A young girl might cry because her mother put lettuce on her sandwich. Overwhelmed by her desire to have things "just right," she might reject the food even after the lettuce is removed because she believes that what is done cannot be undone.

Especially for Nutritionists How can Piaget's theory help you encourage children to eat healthy foods? (see response, page 281)

irreversibility A characteristic of preoperational thought in which a young child thinks that nothing can be undone. A thing cannot be restored to the way it was before a change occurred.

Conservation and Logic

Piaget highlighted several ways in which preoperational intelligence disregards logic. A famous set of experiments involved **conservation,** the notion that the amount of something remains the same (is conserved) despite changes in its appearance.

conservation The principle that the amount of a substance remains the same (i.e., is conserved) even when its appearance changes.

Suppose two identical glasses contain the same amount of pink lemonade, and the liquid from one of these glasses is poured into a taller, narrower glass. If young children are asked whether one glass contains more or, alternatively, both glasses contain the same amount, they will insist that the narrower glass (with the higher level) has more. (See Figure 9.1 for other examples.)

All four characteristics of preoperational thought are evident in this mistake. Young children fail to understand conservation because they focus (*center*) on what they see (*appearance*), noticing only the immediate (*static*) condition. It does not occur to them that they could reverse the process and recreate the level of a moment earlier (*irreversibility*).

Piaget's original tests of conservation required children to respond verbally to an adult's questions. Later research has found that when the tests of logic are simplified or made playful, young children may succeed. In many ways, children indicate via eye movements or gestures that they know something before they can say it in words (Goldin-Meadow & Alibali, 2013). Further, conservation and many more logical ideas are understood bit by bit, with active, guided experience, and glimmers of understanding are apparent even at age 4 (Sophian, 2013).

Easy Question; Obvious Answer (*below, left*) Sadie, age 5, carefully makes sure both glasses contain the same amount. (*below, right*). When one glass of pink lemonade is poured into a wide jar, she triumphantly points to the tall glass as having more. Sadie is like all 5-year-olds; only a developmental psychologist or a 7-year-old child knows better.





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Tests of Various Types of Conservation

Type of Conservation	Initial Presentation	Transformation	Question	Preoperational Child's Answer
Volume	Two equal glasses of liquid.	Pour one into a taller, narrower glass.	Which glass contains more?	The taller one.
Number	Two equal lines of checkers.	Increase spacing of checkers in one line.	Which line has more checkers?	The longer one.
Matter	Two equal balls of clay.	Squeeze one ball into a long, thin shape.	Which piece has more clay?	The long one.
Length	Two sticks of equal length.	Move one stick.	Which stick is longer?	The one that is farther to the right.

FIGURE 9.1

Conservation, Please According to Piaget, until children grasp the concept of conservation at (he believed) about age 6 or 7, they cannot understand that the transformations shown here do not change the total amount of liquid, checkers, clay, and wood.

As with sensorimotor intelligence in infancy, Piaget underestimated what preoperational children could understand. Piaget was right that young children are not as logical as older children, but he did not realize how much they could learn.

Brain scans, video responses measured in milliseconds, and the computer programs that developmentalists now use were not available to him. Studies from the past 20 years show intellectual activity before age 6 that was not previously understood; they also show that Piaget was perceptive about many aspects of cognition (Crone & Ridderinkhof, 2011).

Given the new data, it is easy to criticize Piaget. However, many adults make the same mistakes. For instance, the shapes of boxes and bottles in the grocery store make it hard to compare volume visually and so undermine adults' sense of conservation—that's why laws require that ounces or grams be listed on the containers. Animism is evident in many religious and cultural myths that include talking, thinking animals.

Indeed, many adults in the United States encourage children to believe in Santa Claus, the Tooth Fairy, and so on. If we consider preschoolers foolish to imagine that animals and plants have human traits, how should we judge ourselves if we talk to our pets or mourn the death of a tree? When adults say, "Nothing ever changes," or, "He can never be trusted," is that static reasoning?

A review of the research finds that children are "naïve skeptics . . . as likely to doubt as to believe" (Woolley & Ghossainy, 2013, p. 1496). They use their best judgment and most reliable sources to decide what is true. Adults are often more skeptical than young children because they have more experience, but they also believe in things not seen (from germs to heaven) because other adults whom they trust (scientists or clergy, depending on specifics) say such unseen things exist.

LaunchPad

Video Activity: Achieving Conservation focuses on the changes in thinking that make it possible for older children to pass Piaget's conservation-of-liquid task.

Preschoolers also rely on their own experience and on trusted sources, but their social network is more limited. Consequently, they rely heavily on their parents and on rules governing behavior (Lane & Harris, 2014). Because of their cognitive limits, smart 3-year-olds sometimes are foolish, as Caleb is. (See below.)

a case to study

Stones in the Belly

As we were reading a book about dinosaurs, 3-year-old Caleb told me that some dinosaurs (*sauropods*) have stones in their bellies. It helps them digest their food and then poop and pee.

I was amazed, never having known this before.

"I didn't know that dinosaurs ate stones," I said.

"They don't eat them."

"Then how do they get the stones in their bellies? They must swallow them."

"They don't eat them."

"Then how do they get in their bellies?"

"They are just there."

"How did they get there?"

"They don't eat them," said Caleb. "Stones are dirty. We don't eat them."

I dropped it, but my question apparently puzzled him. Later he asked his mother, "Do dinosaurs eat stones?"

"Yes, they eat stones so they can grind their food," she answered.

At that, Caleb was quiet.

In all of this, preoperational cognition is evident. Caleb is bright; he can name several kinds of dinosaurs, as can many young children.

But logic eludes Caleb. He is preoperational, not operational.

It seemed obvious to me that dinosaurs must have swallowed the stones. However, in his static thinking, Caleb said the stones "are just there." In thinking that is typical of egocentrism, he rejects the thought that they ate them, because he has been told that stones are too dirty to eat.

He is egocentric, reasoning from his own experience, and animistic, in that he thinks animals would not eat stones because he does not. Caleb has no personal experience with dinosaurs, but my question made him think. He trusts his mother, who told him never to eat stones, or, for that matter, sand from the sandbox, or food that fell on the floor. If anyone told him he could eat those things they would seem foolish, as I seemed when I said dinosaurs might eat stones. He did not accept my authority: The implications of the fact that I am his mother's mother are beyond his static thinking.

But, like many young children, Caleb is curious, and my question raised his curiosity. He consulted his authority, my daughter.

Should I have expected him to tell me that I was right, when his mother agreed with me? No. That would have required far more understanding of reversibility and far less egocentrism than most young children can muster.

Vygotsky: Social Learning

For decades, the magical, illogical, and self-centered aspects of cognition dominated our concepts of early-childhood thought. Scientists were understandably awed by Piaget. His description of egocentrism and magical thinking was confirmed daily by anecdotes of young children's behavior.

Vygotsky emphasized another side of early cognition—that each person's thinking is shaped by other people's wishes and goals. He emphasized the social aspects of development, a contrast to Piaget's emphasis on the individual. That led Vygotsky to notice the power of culture, acknowledging that "the culturally specific nature of experience is an integral part of how the person thinks and acts," as several developmentalists explain (Gauvain et al., 2011). Learning is not done in isolation; according to many contemporary educators, it depends on joint engagement.

// **Response for Nutritionists** (from page 279): Take each of the four characteristics of preoperational thought into account. Because of egocentrism, having a special place and plate might assure the child that this food is exclusively his or hers. Since appearance is important, food should look tasty. Since static thinking dominates, if something healthy is added (e.g., grate carrots into the cake, add milk to the soup), do it before the food is given to the child. In the reversibility example in the text, the lettuce should be removed out of the child's sight and the "new" hamburger presented.



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Words Fail Me Could you describe how to tie shoes? The limitations of verbal tests of cognitive understanding are apparent in the explanation of many skills.

OBSERVATION QUIZ What three sociocultural factors make it likely that the child pictured above will learn? (see answer, page 284)

Mentors

Vygotsky believed that cognitive development is embedded in a social context at every age (Vygotsky, 1934/1987). He stressed that children are curious and observant. They ask questions—about how machines work, why weather changes, where the sky ends—and seek answers from more knowledgeable mentors, who might be their parents, teachers, older siblings, or just a stranger. The answers they get are affected by the mentors' perceptions and assumptions—that is, their culture—which shapes their thought.

As you remember from Chapter 2, children learn through *guided participation,* as mentors teach them. Parents are their first guides, although children are guided by many others, too.

According to Vygotsky, children learn because their mentors do the following:

- Present challenges.
- Offer assistance (without taking over).
- Add crucial information.
- Encourage motivation.

Overall, the ability to learn from mentors indicates intelligence; according to Vygotsky, "What children can do with the assistance of others might be in some sense even more indicative of their mental development than what they can do alone" (Vygotsky, 1980, p. 85).

Scaffolding

Vygotsky believed that all individuals learn within their *zone of proximal development (ZPD),* an intellectual arena in which new ideas and skills can be mastered. *Proximal* means "near," so the ZPD includes the ideas children are close to understanding and the skills they can almost master, but are not yet able to demonstrate independently. How and when children learn depends, in part, on the wisdom and willingness of mentors to provide **scaffolding,** or temporary sensitive support, to help them within their developmental zone. (**Developmental Link:** The ZPD is discussed in Chapter 2.)

scaffolding Temporary support that is tailored to a learner's needs and abilities and aimed at helping the learner master the next task in a given learning process.

OBSERVATION QUIZ Is the girl below right- or left-handed? (see answer, page 284)

Good mentors provide plenty of scaffolding, encouraging children to look both ways before crossing the street (while holding the child's hand) or letting them stir the cake batter (perhaps while covering the child's hand on the spoon handle, in guided participation). Crucial in every activity is joint engagement, when both learner and mentor are actively involved together in the learning zone (Adamson et al., 2014).

As always, cultural differences are crucial. Consider book reading, for instance, an activity parents worldwide do with their young children, in part because it fosters language,



TIM HALL/GETTY IMAGES

Count by Tens A large, attractive abacus could be a scaffold. However in this toy store, the position of the balls suggests that no mentor is nearby. Children are unlikely to grasp the number system without a motivating guide.



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Same or Different? Which do you see? Most people focus on differences, such as ethnicity or sex. But a developmental perspective appreciates similarities: book reading to a pre-literate child cradled on a parent's lap.

reading, and moral development. When an adult reads to children, the adult scaffolds—explaining, pointing, listening, describing—within the child's zone of development. Middle-class American adults do not tell the child to be quiet, but often prolong the session by expanding on the child's questions and asking questions of their own, so that the book reading becomes a scaffold for dialogue.

By contrast, book reading in low-income families tends to emphasize content over conversation, with parents telling children what is happening in the story and expecting the child to listen and learn. Comparative research finds that parents scaffold whatever is important in their culture, with Chinese American parents more likely to point out problems encountered by the book's characters because of misbehavior and the Mexican Americans more likely to highlight emotions that the characters might feel (Luo et al., 2014).

Overimitation

Sometimes scaffolding is inadvertent, as when children observe something said or done and then try to do likewise—including things that adults would rather the child not do. Young children curse, kick, and worse because someone else showed them how. One of the ominous behaviors that preschool teachers sometimes witness is a young child trying to get another child to engage in sex. The child must have seen something most adults think children should not see. (This is quite different from the normal curiosity that children have about each other's bodies.)

More benignly, children imitate habits and customs that are meaningless, a trait called **overimitation,** evident in humans but rare in other animals. This stems from the child's eagerness to learn from mentors, allowing "rapid, high-fidelity intergenerational transmission of cultural forms" (Nielsen & Tomaselli, 2010, p. 735).

overimitation When a person imitates an action that is not a relevant part of the behavior to be learned. Overimitation is common among 2- to 6-year-olds when they imitate adult actions that are unnecessary.

Overimitation was demonstrated in a series of experiments with 3- to 6-year-olds, 64 of them from Bushman communities in South Africa and Botswana and, for comparison, 64 from cities in Australia and 19 from aboriginal communities within Australia. Australian middle-class adults often scaffold for children with words and actions, but Bushman adults rarely do. The researchers expected the urban Australian children to follow adult demonstrations, since they were accustomed to learning in that way. They did not expect the Bushman children to do so (Nielsen et al., 2014).

Especially for Driving Instructors
Sometimes your students cry, curse, or quit. How would Vygotsky advise you to proceed? (see response, page 286)

ANSWER TO OBSERVATION QUIZ
(from page 282): Motivation (this father and son are from Spain, where yellow running shoes are popular), human relationships (note the physical touching of father and son), and materials (the long laces make tying them easier).

In part of the study, some children one-by-one from each cultural group observed an adult perform irrelevant actions, such as waving a red stick above a box three times and then using that stick to push down a knob to open the box, which could be easily and more efficiently opened by merely pulling down the same knob by hand. Then children were given the stick and the box. No matter what their cultural background, the children followed the adult example, waving the stick three times and not using their hands directly on the knob.

Other children did not see the demonstration. When they were given the stick and asked to open the box, they simply pulled the knob. Then they observed an adult do the stick-waving opening—and they did something odd: They copied those inefficient actions, even though they already knew the easy way to open the box (Nielsen & Tomaselli, 2010).

Apparently, children everywhere learn from others through observation, even if they have not been taught to do so. They even learn to do things contrary to their prior learning. Thus, scaffolding occurs through observation as well as explicit guidance. Across cultures, overimitation is striking and even generalizes to other similar situations. Children everywhere are strongly inclined to learn whatever adults from their culture do (Nielsen et al., 2014).

That is exactly what Vygotsky expected and explained. Curiously, young children are not adept at figuring out new ways to use various tools (Nielsen et al., 2014). Young children's minds are quick to imitate what adults do, but slow to figure out creative ways to accomplish their goals. That innovative ability, apparently, must wait until more cognitive maturation has occurred.

Language as a Tool

Although all the objects of a culture guide children, Vygotsky believed that words are especially pivotal. He thought language advances thinking in two ways (Fernyhough, 2010). The first way is with internal dialogue, or **private speech,** in which people talk to themselves (Vygotsky, 2012). Young children use private speech often. They talk aloud to review, decide, and explain events to themselves (and, incidentally, to anyone else within earshot) (Al-Namlah et al., 2012).

private speech The internal dialogue that occurs when people talk to themselves (either silently or out loud).

Older preschoolers are more selective, effective, and circumspect, sometimes whispering. Audible or not, private speech aids cognition and self-reflection; adults should encourage it (Perels et al., 2009; Benigno et al., 2011). Many people of all ages talk to themselves when alone or write down ideas to help them think. That is private speech as well. Preschool curricula based on Vygotsky's ideas use games, play, social interaction, and private speech to develop executive functioning (Winsler et al., 2009).

The second way in which language advances thinking, according to Vygotsky, is by mediating the social interaction that is vital to learning (Vygotsky, 2012). This **social mediation** function of speech occurs during both formal instruction (when teachers explain things) and casual conversation.

social mediation Human interaction that expands and advances understanding, often through words that one person uses to explain something to another.

Words entice people into the zone of proximal development, as mentors guide children to learn numbers, recall memories, and follow routines. Indeed, children who count out loud and use other aspects of private speech to help them with numbers are likely to advance in mathematical understanding.

ANSWER TO OBSERVATION QUIZ
(from page 282): Right-handed. Her dominant hand is engaged in something more comforting than exploring the abacus.

STEM Learning

A practical use of Vygotsky's theory concerns the current emphasis on STEM (Science, Technology, Engineering, Math) education. Because finding more young people to specialize in those fields is crucial for economic growth, educators and

political leaders are continually seeking ways to make STEM fields attractive to adolescents and young adults of all ethnicities (Rogers-Chapman, 2013; Wang, 2013).

Research on early childhood suggests that STEM education actually begins long before high school. This is increasingly recognized by experts, who note that most parents and teachers have much to learn about math and science if they wish to teach these subjects to young children (Hong et al., 2013; Bers et al., 2013).

For example, learning about numbers is possible very early in life. Even babies have a sense of whether one, two, or three objects are in a display, although exactly what infants understand about numbers is controversial (Varga et al., 2010). If Vygotsky is correct that words are tools, toddlers need to hear number words and science concepts early (not just counting and shapes, but fractions and science principles, such as the laws of motion) so that other knowledge becomes accessible. In math understanding, it is evident that preschoolers gradually learn to

- Count objects, with one number per item (called *one-to-one correspondence*).
- Remember times and ages (bedtime at 8, a child is 4 years old, and so on).
- Understand sequence (first child wins, last child loses).
- Know what numbers are higher than others. (It is not obvious to young children that 7 is greater than 4.)

These and many other cognitive accomplishments of young children have been the subject of extensive research: Mentoring and language are always found to be pivotal.

Especially in math, computers can promote a dialogue that helps contemporary young children learn. Educational software becomes "a conduit for collaborative learning" (Cicconi, 2014, p. 58) as Web 2.0 programs respond to the particular abilities and needs of the learner.

Often in preschool classrooms with interactive education, two or three children work together, each mentoring the other, talking aloud as the computer prompts them. This can occur at home, too: Educators frown on using a computer screen as a substitute for human interaction, but they sometimes consider it an adjunct to promote learning, just as a book might be (Alper, 2013).

Culture affects language, which in turn fosters math knowledge. For example, English-speaking and Chinese-speaking preschoolers seem to have equal comprehension of 1 to 10, but the Chinese are ahead in their understanding of 11 to 19. Among the many possible explanations is a linguistic one: In all the Chinese dialects, the names for 11 to 19 are logical and direct, the equivalent of ten-one, ten-two, ten-three, and so on. This system is easier for young children to understand than eleven, twelve, thirteen, and so on.

German-speaking children may be slower to master numbers from 20 to 99, since they say the equivalent of one-and-twenty, two-and-twenty, and so on, not twenty-one, twenty-two, and so on. In these and many other ways, cultural restraints and routines affect young children's understanding of math (Göbel et al., 2011).

By age 3 or 4, children's brains are mature enough to comprehend numbers, store memories, and recognize routines. Whether or not children actually demonstrate such understanding depends on what they hear and how they participate in various activities within their families, schools, and cultures.

Some 2-year-olds hear sentences such as "One, two, three, takeoff," and "Here are two cookies," and "Dinner in five minutes" several times a day. They are shown an interesting

OBSERVATION QUIZ Could this photo have been taken 10 years ago? (see answer, page 287)

Learning or Playing? Teachers once demanded that each child sit at his or her desk, hands folded, mouth shut, too far from other children to touch them or even pass a note. Despite their divergent perspectives, both Piaget and Vygotsky studied how children actually learn—and the classroom you see here is a result.



PHOTO IMAGES, GETTY IMAGES

Response for Driving Instructors (from page 284): Use guided participation to scaffold the instruction so that your students are not overwhelmed. Be sure to provide lots of praise and days of practice. If emotion erupts, do not take it as an attack on you.

bit of moss, or are alerted to the phases of the moon, or learn about the relationship between pace, breathing, and the steepness of a hill. Others never hear such comments—and they have a harder time with math in first grade, with science in the third grade, and with STEM subjects when they are older. According to Vygotsky, words mediate between brain potential and comprehension, and this process begins long before formal education.

Children's Theories

Piaget and Vygotsky both recognized that children work to understand their world. No contemporary developmental scientist doubts that. How do children acquire their impressive knowledge? Part of the answer is that children do more than gain words and concepts; they develop theories to help them understand and remember—theories that arise from both brain maturation and personal experience (Baron-Cohen et al., 2013).

Theory-Theory

theory-theory The idea that children attempt to explain everything they see and hear by constructing theories.

Humans of all ages want explanations. **Theory-theory** refers to the idea that children naturally construct theories to explain whatever they see and hear. In other words, the theory about how children think is that they construct a theory. All people

> search for causal regularities in the world around us. We are perpetually driven to look for deeper explanations of our experience, and broader and more reliable predictions about it. . . . Children seem, quite literally, to be born with . . . the desire to understand the world and the desire to discover how to behave in it.
>
> *Gopnik, 2001, p. 66*

According to theory-theory, the explanation for cognition is that humans seek reasons, causes, and underlying principles to make sense of their experience. That requires curiosity and thought, connecting bits of knowledge and observations, which is what young children do. Humans always want theories (even false ones, sometimes) to help them understand the world. Especially in childhood, theories are subject to change as new evidence accumulates (Meltzoff & Gopnik, 2013).

Exactly how do children seek explanations? They ask questions, and, if they are not satisfied with the answers, they develop their own theories. This is particularly evident in children's understanding of God and religion. One child thought his grandpa died because God was lonely; another thought thunder occurred because God was rearranging the furniture.

Theories do not appear randomly. Children wonder about the underlying purpose of whatever they observe, and in order to develop a theory about what causes what and why, they note how often a particular event occurs. They follow the same processes that scientists do: asking questions, developing hypotheses, gathering data, and drawing conclusions.

Of course, a child's method of understanding and interpreting experience lacks the rigor of scientific experiments, but questions of physics, biology, and the social sciences are explored: "infants and young children not only detect statistical patterns, they use those patterns to test hypotheses about people and things" (Gopnik, 2012, p. 1625). Their conclusions are not always correct: Like all good scientists, they allow new data to promote revision.

For instance, when I was a young child, I noticed that my father never carried an umbrella. Since I looked up to him, I assumed he must have had a good reason. Neither did my brother, which confirmed for me that my father was right. Consequently, throughout all my adult years, I never carried an umbrella.

Over time I developed many reasons for my father's behavior. He must have realized, I decided, that umbrellas poke people in the eye, get forgotten, blow away, and are lost. Then, when Dad was in his 80s, my brother asked him why he didn't like umbrellas. The answer stunned me: "Chamberlain."

Neville Chamberlain was famous for carrying an umbrella when he was prime minister of England from 1937 to 1940. He was photographed with his black umbrella after signing the Munich Agreement in 1938, when he mistakenly and naively announced that Hitler would not attack England. For Dad, umbrellas symbolized foolish trust and he said that no political leader would dare carry an umbrella. I had constructed a theory to justify something I observed. That is theory-theory.

In the egocentrism of early childhood, preschoolers theorize that everyone operates as they themselves do, which makes them more aware of situational differences than personality differences. For instance, each child knows that he or she acts differently, say, in a familiar playground on a sunny day than on an unfamiliar street in a thunderstorm. Context is crucial, but the child is the same person in both situations.

That explains the results of a series of experiments in which children observe that one puppet refuses to play on a trampoline or ride a bicycle and another puppet does both. Four-year-olds theorize that the playing puppet must know that the trampoline is safe, not that one puppet is brave and the other fearful. By age 6, children are more able to explain behavior based on temperament, not situation (Seiver et al., 2013).

One common theory-theory is that everyone intends to do things correctly. For that reason, when asked to repeat something ungrammatical that an adult says, children often correct the grammar. They theorize that the adult intended to speak grammatically but failed to do so (Over & Gattis, 2010).

This is an example of a general principle: Children theorize about intentions before they imitate what they see. As you have read, when children saw an adult wave a stick before opening a box, the children theorized that, since the adult did it deliberately, stick-waving must somehow be important.

ANSWER TO OBSERVATION QUIZ (from page 285) No. Each child has a tablet--not used in schools until 2010. In the next five years, some school systems purchased tablets for every child, as is apparent here.

Theory of Mind

Mental processes—thoughts, emotions, beliefs, motives, and intentions—are among the most complicated and puzzling phenomena that humans encounter every day. Adults wonder why people fall in love with the particular persons they do, why they vote for the candidates they do, or why they make foolish choices—from signing for a huge mortgage to buying an overripe cucumber. Children are likewise puzzled about a playmate's unexpected anger, a sibling's generosity, or an aunt's too-wet kiss.

To know what goes on in another's mind, people develop a *folk psychology,* which includes ideas about other people's thinking, called **theory of mind.** Theory

theory of mind A person's theory of what other people might be thinking. In order to have a theory of mind, children must realize that other people are not necessarily thinking the same thoughts that they themselves are. That realization seldom occurs before age 4.

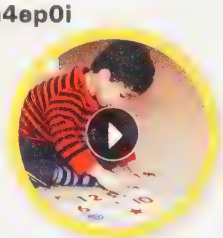


Candies in the Crayon Box Anyone would expect crayons in a crayon box, but once a child sees that candy is inside, he expects that everyone else will also know that candies are inside!

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Especially for Social Scientists Can you think of any connection between Piaget's theory of preoperational thought and 3-year-olds' errors in this theory-of-mind task? (see response, page 290)

Video: Theory of Mind: False-Belief Tasks
http://qrs.ly/ba4ep0i



AMR PARKH SHUTTERSTOCK

of mind is an emergent ability, slow to develop but typically beginning in most children at about age 4 (Carlson et al., 2013). Some aspects of theory of mind develop sooner than age 4, and some later. However, longitudinal research finds that the preschool years typically begin with 2-year-olds not knowing that other people think differently than they do but end with 6-year-olds having a well-developed theory of mind (Wellman et al., 2011).

Generally, realizing that thoughts do not mirror reality is beyond very young children, but that realization dawns on them sometime after age 3. It then occurs to them that people can be deliberately deceived or fooled—an idea that requires some theory of mind.

In one of dozens of false-belief tests that researchers have developed, a child watches a puppet named Max put a toy dog into a red box. Then Max leaves and the child sees the dog taken out of the red box and put in a blue box. When Max returns, the child is asked, "Where will Max look for the dog?" Most 3-year-olds confidently say, "In the blue box"; most 6-year-olds correctly say, "In the red box," a pattern found in more than a dozen nations. Interestingly, although some cultural differences appear, the most notable differences are neurological, not cultural: Deaf or autistic children are remarkably slow to develop theory of mind (Carlson et al., 2013).

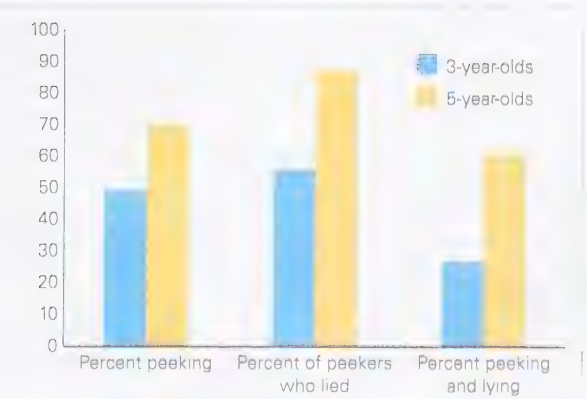
The development of theory of mind can be seen when young children try to escape punishment by lying. Their face often betrays them: worried or shifting eyes, pursed lips, and so on. Parents sometimes say, "I know when you are lying," and, to the consternation of most 3-year-olds, parents are usually right.

In one experiment, 247 children, aged 3 to 5, were left alone at a table that had an upside-down cup covering dozens of candies (Evans et al., 2011). The children were told *not* to peek, and the experimenter left the room. For 142 children (57 percent), curiosity overcame obedience. They peeked, spilling so many candies onto the table that they could not put them back under the cup. The examiner returned, asking how the candies got on the table. Only one-fourth of the participants (more often the younger ones) told the truth.

The rest lied, and their skill increased with their age. The 3-year-olds typically told hopeless lies (e.g., "The candies got out by themselves"); the 4-year-olds told unlikely lies (e.g., "Other children came in and knocked over the cup"). Some of the 5-year-olds, however, told plausible lies (e.g., "My elbow knocked over the cup accidentally").

This particular study was done in Beijing, China, but the results seem universal: Older children are better liars. Beyond the age differences, the experimenters found that the more logical liars were also more advanced in theory of mind and executive functioning (Evans et al., 2011), which indicates a more mature prefrontal cortex (see Figure 9.2).

Of course, many egocentric children convince themselves that something is true when it is not—as do some adults. This does not mean that they are unable to recount what they see and hear, but it does mean that what they say should be evaluated, not swallowed whole. (See A View From Science.)



Source: Evans et al., 2011

FIGURE 9.2
Better with Age? Could an obedient and honest 3-year-old become a disobedient and lying 5-year-old? Apparently yes, as the proportion of peekers and liars in this study more than doubled over those two years. Does maturation make children more able to think for themselves or less trustworthy?

a view from science

Witness to a Crime

One application of early cognitive competency has received attention among lawyers and judges. Children may be the only witnesses to crimes, especially of sexual abuse or domestic violence. Can a young child's words be trusted? Adults have gone to both extremes in answering this question. As one legal discussion begins:

> Perhaps as a result of the collective guilt caused by disbelieving the true victims of this abuse, in recent years the pendulum has swung in the opposite direction, to an unwavering conviction that a young child is incapable of fabricating a story of abuse, even when the tale of mistreatment is inherently incredible.
>
> *[Shanks, 2011]*

The answer to the question, "Is child testimony accurate?" is: "Sometimes." In recent years, psychologists have shown that people of all ages misremember (Frenda et al., 2011; Lyons et al., 2010) and that each age group misremembers in particular ways.

Younger children, not yet imbued with stereotypes, are sometimes more accurate than older witnesses who are influenced by prejudice (Brainerd et al., 2008), but they may confuse time, place, person, and action—even though they may describe each accurately. Further, young children want to please adults and themselves, and they may lie to do so. Developmental psychologists have developed many research-based suggestions to improve the accuracy of child witnesses (Lamb, 2014).

Words and expressions can plant false ideas in young children's minds, either deliberately (as an abuser might) or inadvertently (as a fearful parent might). Children's shaky grasp of reality makes them vulnerable to scaffolding memories that are imagined, not experienced (Bruck et al., 2006). This happened tragically 35 years ago in many jurisdictions, when adults suddenly realized that small children could be sexually abused and then decided that sexual abuse was rampant in preschools.

For instance, 3-year-olds at Wee Care nursery school in New Jersey convinced a judge that a teacher had sexually abused them in bizarre ways (including making them lick peanut butter off her genitals) (Ceci & Bruck, 1995) when, in fact, no abuse had occurred. In retrospect, one wonders why any adult believed what they heard. Since then, much has been learned about witnesses of all ages.

Young children are not necessarily worse than adults at recounting experiences if they are interviewed with open-ended questions by someone who does not indicate what the preferred answers are (Brainerd et al., 2008; Feltis et al., 2010). Children who have already learned to tell coherent narratives provide more accurate accounts of what happened (Kulkofsky & Klemfuss, 2008). Whether or not a child understands the difference between truth and falsehood is irrelevant to accuracy; the crucial factor is whether the interviewer is straightforward or suggestive (Lyon et al., 2008).

With sexual abuse in particular, a child might believe that some lewd act is OK if an adult says so. Only years later does the victim realize that it was abuse. Research on adult memory finds that sometimes adults reinterpret what happened to them, with genuine memories of experiences that were criminal. However, people of all ages sometimes believe that an event, including abuse, occurred when it did not (Geraerts et al., 2009).

This knowledge provides guidelines for police officers, social workers, judges, teachers, and parents. When children are witnesses, they should simply be asked to tell what happened, perhaps with eyes closed to reduce their natural attempt to please (Kyriakidou et al., 2014). If, instead, an adult says, "Did he touch you there?" a child might say yes if he thinks that is what the adult wants to hear. Preschoolers' cognition is a mix of egocentric fantasy, social influence, and innocent honesty—care must be taken to neither automatically believe nor disbelieve what children say.

Brain and Context

Many studies have found that a child's ability to develop theories correlates with neurological maturation, which also correlates with advances in executive processing—the reflective, anticipatory capacity of the mind (Mar, 2011; Baron-Cohen et al., 2013). Detailed brain studies find that theory of mind activates several areas of the brain (Koster-Hale & Saxe, 2014). This makes sense, as theory of mind is a complex ability that humans develop in social contexts, and thus is not likely to reside in just one neurological region.

Evidence for the crucial role of brain maturation comes from the other research on the same 3- to 5-year-olds whose lying was studied. The experimenters asked the children to say "day" when they saw a picture of the moon and "night" when they saw a picture of the sun.



Brothers and Sisters When every family had many children, as in this Western Australian family, even 3-year-olds had to learn when a brother was to be trusted not to move the chair.

The children needed to inhibit their automatic reaction, and the ability to do this indicates advanced executive function, which correlates with maturation of the prefrontal cortex. Even when compared to other children who were the same age, those who failed the day–night tests typically told impossible lies, whereas their age-mates who were high in executive function told more plausible lies (Evans et al., 2011).

Does the crucial role of neurological maturation make context irrelevant? No: Nurture is always important. For instance, research finds that language development fosters theory of mind, especially when mother–child conversations involve thoughts and wishes. Similarly, social interactions with other children advance a child's thinking process, especially when the other children are siblings of about the same age (McAlister & Peterson, 2013). As one expert quipped, "Two older siblings are worth about a year of chronological age" (Perner, 2000, p. 383).

As brothers and sisters argue, agree, compete, and cooperate, and as older siblings fool younger ones, it dawns on 3-year-olds that not everyone thinks as they do. Theory of mind advances. By age 5, siblings have learned to persuade their younger siblings to give them a toy, and they've learned how to gain parental sympathy by acting as if their older brothers and sisters have victimized them. Parents, beware: Asking, "Who started it?" may be irrelevant.

SUMMING UP Preoperational children, according to Piaget, can use symbolic thought but are illogical and egocentric, limited by the appearance of things and by their immediate experience. Their egocentrism occurs not because they are selfish, but because their minds are immature. Vygotsky realized that children are powerfully influenced by their social contexts, including their mentors and the cultures in which they live. In their zone of proximal development, children are ready to move beyond their current understanding, especially if deliberate or inadvertent scaffolding occurs.

Children use their cognitive abilities to develop theories about their experiences, as is evident in theory-theory and in theory of mind, which appears between ages 3 and 5. Humans of all ages seek to explain their observations and become more adept at understanding the thoughts and goals of other people. This seems to be the result of both brain maturation and experience.

WHAT HAVE YOU LEARNED?

1. What are the strengths of preoperational thought?
2. What is the difference between egocentrism in a child and selfishness in an adult?
3. How does guided participation increase a child's zone of proximal development?
4. Why did Vygotsky think that talking to oneself is not a sign of illness but an aid to cognition?
5. What factors spur the development of theory of mind?

Response for Social Scientists (from page 288): According to Piaget, preschool children focus on appearance and on static conditions (so they cannot mentally reverse a process). Furthermore, they are egocentric, believing that everyone shares their point of view. No wonder they believe that they had always known the puppy was in the blue box and that Max would know that, too.

Language Learning

Learning language is the premier cognitive accomplishment of early childhood. Two-year-olds use short, telegraphic sentences ("Want cookie," "Where Daddy go?"), omitting adjectives, adverbs, and articles. By contrast, 5-year-olds seem able to say almost anything (see At About This Time).

at about this time

Language in Early Childhood*

Approximate Age	Characteristic or Achievement in First Language
2 years	*Vocabulary:* 100–2,000 words *Sentence length:* 2–6 words *Grammar:* Plurals; pronouns; many nouns, verbs, adjectives *Questions:* Many "What's that?" questions
3 years	*Vocabulary:* 1,000–5,000 words *Sentence length:* 3–8 words *Grammar:* Conjunctions, adverbs, articles *Questions:* Many "Why?" questions
4 years	*Vocabulary:* 3,000–10,000 words *Sentence length:* 5–20 words *Grammar:* Dependent clauses, tags at sentence end ("... didn't I?" "... won't you?") *Questions:* Peak of "Why?" questions; many "How?" and "When?" questions
6 years	*Vocabulary:* 5,000–30,000 words *Sentence length:* Some seem unending ("... and ... who ... and ... that ... and ...") *Grammar:* Complex, depending on what the child has heard, with some children correctly using the passive voice ("Man bitten by dog") and subjunctive ("If I were ...") *Questions:* Some about social differences (male–female, old–young, rich–poor) and many other issues

*These norms are based on middle-class children in the United States. Children of diverse backgrounds and contexts will differ, and even many middle-class U.S. children are slower or faster to reach these norms.

A Sensitive Time

Brain maturation, myelination, scaffolding, and social interaction make early childhood ideal for learning language. As you remember from Chapter 1, scientists once thought that early childhood was a *critical period* for language learning—the *only* time when a first language could be mastered and the best time to learn a second or third one.

It is easy to understand why they thought so. Young children have powerful motivation and ability to sort words and sounds into meaning (theory-theory), which makes them impressive language learners. For that reason, teachers and parents should converse with children many hours each day. However, the critical-period hypothesis is false: Many people learn a new language after age 6.

Instead, early childhood is a *sensitive period* for language learning—for rapidly and easily mastering vocabulary, grammar, and pronunciation. Young children are language sponges; they soak up every verbal drop they encounter.

Exactly how sensitive the preschool years are is still disputed (DeKeyser, 2013). There is no doubt that it is easier to learn a first or second language earlier than later, nor is there any doubt that some people learn a second language in adulthood. Adult language learning is harder, but not impossible.

Preoperational thinking—which is not logical—helps with language. For example, in a conversation I had with Asa, he said a toy lion was a mother. I said it couldn't be a mother because it had a mane. Rather than realizing that I might know something about male and female lions, and rather than asking about the

LaunchPad



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Video Activity: Language Acquisition in Young Children features video clips of a new sign language created by deaf Nicaraguan children and provides insights into how language evolves.

new word (mane), he confidently insisted that this particular lion was a mother with a mane.

Asa is not alone. One of the valuable (and sometimes frustrating) traits of young children is that they talk about many things to adults, to each other, to themselves, to their toys—unfazed by misuse, mispronunciation, ignorance, stuttering, and so on (Marazita & Merriman, 2010). Language comes easily partly because preoperational children are not self-critical about what they say. Egocentrism has advantages; this is one of them.

The Vocabulary Explosion

The average child knows about 500 words at age 2 and more than 10,000 at age 6 (Herschensohn, 2007). That's more than six new words a day. These are averages. Estimates of vocabulary size at age 6 vary from 5,000 to 30,000: Some children learn six times as many words as others. Always, however, vocabulary builds quickly, and comprehension is more extensive than speech.

It is not always easy to know how many words a child understands, in part because some tests of vocabulary are more stringent than others (Hoffman et al., 2013). For example, after children listened to a book about a raccoon that saw its reflection in the water, they were asked what "reflection" means. Here are five answers:

1. "It means that your reflection is yourself. It means that there is another person that looks just like you."
2. "Means if you see yourself in stuff and you see your reflection."
3. "Is like when you look in something, like water, you can see yourself."
4. "It mean your face go in the water."
5. "That means if you the same skin as him, you blend in." (Hoffman et al., 2013, pp. 13–14)

Which of these five children knows the vocabulary word? The correct answer to that question could be none, all, or some number in between.

In another example, when a story included "a chill ran down his spine," children were asked what chill meant. One child answered, "When you want to lay down and watch TV—and eat nachos" (Hoffman et al., 2013, p. 15). Correct?

Fast-Mapping

After painstakingly learning one word at a time between 12 and 18 months of age, children develop interconnected categories for words, a kind of grid or mental map that makes speedy vocabulary acquisition possible. Each of the children above answered the question. They thought they knew the word, and they sort of did.

fast-mapping The speedy and sometimes imprecise way in which children learn new words by tentatively placing them in mental categories according to their perceived meaning.

Learning a word after one exposure is called **fast-mapping** (Woodward & Markman, 1998). Rather than figuring out the exact definition after hearing it in several contexts, children hear a word once and quickly stick it into a category in their mental language grid. They think they understand it.

Language mapping is not precise. For example, children rapidly connect new animal names close to already-known animal names, without knowing all the details. Thus, *tiger* is easy to map if you know *lion*, but a leopard might be called a tiger. A trip to the zoo facilitates fast-mapping of animal names because zoos scaffold learning by placing similar animals near each other.

All preschoolers can fast map words, but some children are quicker than others, and some words are easier than others. A study that tested young children's ability to fast-map two made-up words (koob and tade) found that it was easier to remem-

ber the unusual word (koob) because it was less likely to be confused with other similar-sounding words (Weismer et al., 2013).

Picture books offer many opportunities to advance vocabulary through scaffolding and fast-mapping. A mentor might encourage the next steps in the child's zone of proximal development, such as that tigers have stripes and leopards spots, or, for an older child, that calico cats are almost always female and that lions with manes are always male.

This process explains children's learning of color words. Generally, 2-year-olds already know some color words, but they fast-map them (K. Wagner et al., 2013). For instance, "blue" could be used for some greens or grays. It is not that children cannot see the hues. Instead, they apply words they know to broad categories, and they have not yet learned the boundaries that adults use.

Thus, all women may be called mothers, all cats can be kitties, and all bright colors red. As one team of scientists explains, adult color words are the result of slow-mapping (K. Wagner et al., 2013), which is not what young children do.

Words and the Limits of Logic

Closely related to fast-mapping is a phenomenon called *logical extension:* After learning a word, children use it to describe other objects in the same category. One child told her father she had seen some "Dalmatian cows" on a school trip to a farm. Instead of criticizing her foolishness, he remembered the Dalmatian dog she had petted the weekend before and realized that she saw Holstein cows, not Jersey ones.

Bilingual children who don't know a word in the language they are speaking often insert a word from the other language, code-switching in the middle of a sentence instead of the usual code-switching that occurs when the context changes. That mid-sentence switch may be considered wrong, but actually that is evidence of the child's drive to communicate.

To call it "Spanglish" when a Spanish-speaking person uses some English words deprecates a logical way to explain something (Otheguy & Stern, 2010). Soon, children realize who understands which language, and they avoid substitutions when speaking to a monolingual person. That illustrates theory of mind.

Some English words are particularly difficult for every child to use correctly—*who/whom, have been/had been, here/there, yesterday/tomorrow.* More than one child has awakened on Christmas morning and asked, "Is it tomorrow yet?" A child told to "stay there" or "come here" may not follow instructions because the terms are confusing. It might be better to say, "Stay there on that bench" or "Come here to hold my hand." Every language has difficult concepts that are expressed in words; children everywhere learn them eventually.

Extensive study of children's language abilities finds that fast-mapping is only one of many techniques that children use to learn language. When a word does not refer to an object on the mental map, children find other ways to master it (Carey, 2010). If a word does not refer to anything the child can see or otherwise sense or act on, it may be ignored. Always, however, action helps. A hole is to dig; love is hugging; hearts beat.

Acquiring Grammar

Remember from Chapter 6 that *grammar* includes structures, techniques, and rules that communicate meaning. Knowledge of grammar is essential for learning to speak, read, and write. A large vocabulary is useless unless a person knows how to put words together. Each language has its own grammar rules; that's one reason children speak in one-word sentences first.

Brain and Basics

By age 2, children understand the basics. For example, English-speaking children know word order (subject/verb/object), saying, "I eat apple," rather than any of the five other possible sequences of those three words. They use plurals, tenses (past, present, and future), and nominative, objective, and possessive pronouns (*I, me,* and *mine* or *my*).

Children apply rules of grammar as soon as they figure them out, using their own theories about how language works and their experience regarding when and how often various rules apply (Meltzoff & Gopnik, 2013). For example, English-speaking children quickly learn to add an *s* to form the plural: Toddlers follow that rule when they ask for two cookies or more blocks.

Soon they add an *s* to make the plural of words they have never heard before, even nonsense words. If preschoolers are shown a drawing of an abstract shape, told it is called a *wug,* and are then shown two of these shapes, they say there are two *wugs.* Children realize words have a singular and a plural before they use that grammar form themselves (Zapf & Smith, 2007).

One reason for variation in particulars of language learning is that several parts of the brain are involved, each myelinating at a distinct rate. Furthermore, many genes and alleles affect comprehension and expression. In general, genes affect *expressive* (spoken or written) language more than *receptive* (heard or read) language. Thus, some children are relatively talkative or quiet because they inherit that tendency, but experience (not genes) determines what they understand. For that, parents and teachers are crucial.

Grammar Mistakes

Sometimes children apply the rules of grammar when they should not. This error is called **overregularization.** By age 4, many children overregularize that final *s,* talking about *foots, tooths,* and *mouses.* This signifies knowledge, not stupidity: Many children first say words correctly (*feet, teeth, mice*), repeating what they have heard. Later, they are smart enough to apply the rules of grammar, and overregularize, assuming that all constructions follow the rules (Ramscar & Dye, 2011). The child who says, "I goed to the store" needs to hear, "Oh, you went to the store?" rather than criticism.

overregularization The application of rules of grammar even when exceptions occur, making the language seem more "regular" than it actually is.

pragmatics The practical use of language that includes the ability to adjust language communication according to audience and context.

More difficult to learn is an aspect of language called **pragmatics**—knowing which words, tones, and grammatical forms to use with whom (Siegal & Surian, 2012). In some languages, it is essential to know which set of words to use when a person is older or not a close friend or family member.

For example, French children learn the difference between *tu* and *vous* in early childhood. Although both words mean "you," *tu* is used with familiar people, while *vous* is the more formal expression (as well as the plural expression). In other languages, children learn that there are two words for grandmother, depending on whose mother she is.

English does not make those distinctions, but pragmatics is important for early-childhood learning nonetheless. Children learn that there are many practical differences in vocabulary and tone depending on the context and, once theory of mind is established, on the audience.

Knowledge of pragmatics is evident when a 4-year-old pretends to be a doctor, a teacher, or a parent. Each role requires different speech. On the other hand, children often blurt out questions that embarrass their parents ("Why is that lady so fat?" or "I don't want to kiss grandpa because his breath smells"): The pragmatics of polite speech require more social understanding than many young children possess.

Learning Two Languages

Language-minority people (those who speak a language that is not their nation's dominant one) suffer if they do not also speak the majority language. In the United States, those who are not proficient in English have lower school achievement, diminished self-esteem, and inadequate employment, as well as many other problems. Fluency in English can erase these liabilities; fluency in another language then becomes an asset.

In the United States in 2011, 22 percent of schoolchildren spoke a language other than English at home, with most of them (77 percent) also speaking English well, according to their parents (U.S. Census Bureau, 2011) (see Figure 9.3). The percentage of bilingual children is higher in many other nations. In many African, Asian, and European nations, by sixth grade most schoolchildren are bilingual, and some are trilingual.

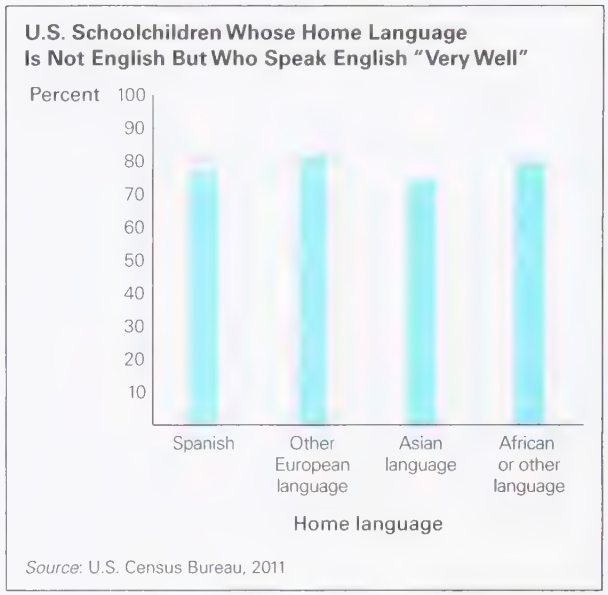


FIGURE 9.3

Mastering English: The Younger, the Better Of all the schoolchildren whose home language is not English, this is the proportion who, according to their parents, speak English well. Immigrant children who attend school almost always master English within five years.

How and Why

Unlike a century ago, everyone now seeking U.S. citizenship must be able to speak English. Some people believe that national unity is threatened by language-minority speakers. By contrast, other people emphasize that international understanding is crucial and that ideally, everyone should speak several languages.

Should a nation have one official language, several, or none? Individuals and nations have divergent answers. Switzerland has three official languages; Canada has two; India has one national language (Hindi), but many states of India also have their own, for a total of 28 official languages; the United States has none.

Some adults fear that young children who are taught two languages might become semilingual, not bilingual, "at risk for delayed, incomplete, and possibly even impaired language development" (Genesee, 2008, p. 17). Others have used their own experience to argue the opposite, that "there is absolutely no evidence that children get confused if they learn two languages" (Genesee, 2008, p. 18).

This second position has much more research support. Soon after the vocabulary explosion, children who have heard two languages since birth usually master two distinct sets of words and grammar, along with each language's pauses, pronunciations, intonations, and gestures. Proficiency is directly related to how much language they hear (Hoff et al., 2012).

Early childhood is the best time to learn languages. Neuroscience finds that for adults who mastered two languages when they were young, both languages are located in the same areas of the brain with no impact on the cortex structure (Klein et al., 2014). They manage to keep the two languages separate, activating one and temporarily inhibiting the other when speaking to a monolingual person. They may





Camels Protected, People Confused Why the contrasting signs? Does everyone read English at the international airport in Chicago (O'Hare) but not on the main road in Tunisia?

be a millisecond slower to respond when they must switch languages, but their brains function better overall. Being bilingual benefits the brain lifelong, further evidence for plasticity. Indeed, the bilingual brain may provide some resistance to Alzheimer's dementia in old age (Costa & Sebastián-Gallés, 2014).

Learning a "foreign" language in high school or college, as required of most U.S. children, is too late for fluency. After childhood, the logic of language is possible to grasp, so adults can learn the rules of forming the past tense, for instance. However, pronunciation, idioms, and exceptions to the rules are confusing and rarely mastered after puberty. The human brain is designed to learn language best in childhood.

Do not equate pronunciation and spoken fluency with comprehension and reading ability. Many adults who speak the majority language with an accent are nonetheless proficient in the language and culture (difference is not deficit). From infancy on, hearing is more acute than vocalization. Almost all young children mispronounce whatever language they speak, blithely unaware of their mistakes.

For example, almost all young children transpose sounds (*magazine* becomes *mazagine*), drop consonants (*truck* becomes *ruck*), convert difficult sounds to easier ones (*father* becomes *fadder*), and drop complex sounds (*cherry* become *terry*). Mispronunciation does not impair fluency primarily because young children are more receptive than expressive—they hear better than they talk. For instance, when 4-year-old Rachel asked for a "yeyo yayipop," her father repeated, "You want a yeyo yayipop?" She replied, "Daddy, sometimes you talk funny."

Language Loss and Gains

Schools in all nations stress the dominant language, sometimes exclusively. Consequently, language-minority parents fear that their children will make a *language shift*, becoming more fluent in the school language than in their home language, which might be forgotten. Language shift occurs everywhere if theory-theory leads children to conclude that their first language is inferior to the new one (Bhatia & Ritchie, 2013).

Some language-minority children in Mexico shift to Spanish, some children of Canada's First Nations (as native peoples are called there) shift to French, some children in the United States shift to English. In China, all speak some form of Chinese, but some shift occurs from Mandarin, Cantonese, and so on to another.

No shift is inevitable: The attitudes and practices of parents and the community are crucial. Another crucial aspect is cohort, as shown by a multi-faceted study of children who switched from Bangla to English when they entered primary school in London. Those children, now adult, often no longer teach their children the language and the customs of their parents (Rasinger et al., 2013).



Bilingual Learners These are Chinese children learning a second language. Could this be in the United States? No, this is a class in the first Chinese-Hungarian school in Budapest. There are three clues: the spacious classroom, the trees outside, and the letters on the book.

Remember that young children are preoperational: They center on the immediate status of their language (not on future usefulness or past glory), on appearance more than substance. No wonder many shift toward the language of the dominant culture.

Since language is integral to culture, if a child is to become fluently bilingual, everyone who speaks with the child should show appreciation of both cultures, and children need to hear twice as much talk as usual (Hoff et al., 2012). If the parents do not speak the majority language, they benefit their child's learning by talking, listening, and playing with the child extensively in the home language. Learning one language well makes it easier to learn another (Hoff et al., 2014).

The same practices can make a child fluently trilingual, as some 5-year-olds are. One parent might spend hours each day talking and reading to a child in French, for instance, the other parent in English, and that child might play with friends and learn from teachers at a Spanish-speaking preschool.

The extent of exposure is crucial: Unfortunately it is typical for one parent to speak with the child much less than the other, and the child's language learning reflects that deficit (MacLeod et al., 2013). If a young child is immersed in three languages, he or she may speak all three without an accent—except whatever accent their mother, father, and friends have.

Especially for Immigrant Parents You want your children to be fluent in the language of your family's new country, even though you do not speak that language well. Should you speak to your children in your native tongue or in the new language? (see response, page 300)

Listening, Talking, and Reading

Because understanding the printed word is crucial, a meta-analysis of about 300 studies analyzed which activities in early childhood aided reading later on. Both vocabulary and phonics (precise awareness of the sounds of words) predicted literacy (Shanahan & Lonigan, 2010). Five specific strategies and experiences were particularly effective for children of all income levels, languages, and ethnicities.

1. *Code-focused teaching.* In order for children to read, they must "break the code" from spoken to written words. It helps if they learn the letters and sounds of the alphábet (e.g., "*A*, alligators all around" or, conventionally, "*B* is for baby").
2. *Book reading.* Vocabulary as well as familiarity with pages and print will increase when adults read to children, allowing questions and conversation.
3. *Parent education.* When teachers and other professionals teach parents how to stimulate cognition (as in book reading), children become better readers. Adults need to use words to expand vocabulary. Unfortunately, too often adults use words primarily to control ("don't touch"; "stop that"), not to teach.
4. *Language enhancement.* Within each child's zone of proximal development, mentors can expand vocabulary and grammar, based on the child's knowledge and experience.
5. *Preschool programs.* Children learn from teachers, songs, excursions, and other children. (We discuss variations of early education next, but every study finds that preschools advance language acquisition.)

SUMMING UP Children learn language rapidly and well during early childhood, with an explosion of vocabulary and mastery of many grammatical constructions. Fast-mapping is one way children learn. Overregularization, mispronunciation, and errors in precision are common and are not problematic at this age. Instead, practical communication skills advance.

Young children can learn two languages almost as easily as one if adults talk frequently, listen carefully, and value both languages. In brain development, children benefit from learning two languages. However, some children whose parents speak a minority language undergo a language shift, abandoning their first language. Others never master a second language because they were not exposed to one during the sensitive time for language learning.

WHAT HAVE YOU LEARNED?

1. What is the evidence that early childhood is a sensitive time for learning language?
2. How does fast-mapping aid the language explosion?
3. How does overregularization signify a cognitive advance?
4. What in language learning shows the limitations of logic in early childhood?
5. What are the advantages of teaching a child two languages?
6. How can the language shift be avoided?

Early-Childhood Schooling

Today, every nation provides early-childhood education. It may be financed by the government or privately. It may be for a privileged few or for almost every child (Georgeson & Payler, 2013).

In France, Denmark, Norway, and Sweden, more than 95 percent of all 3- to 5-year-olds are enrolled in government-sponsored schools. Norway also pays for education for 1- and 2-year-olds, and 80 percent of them attend (Ellingsaeter, 2014). The reasons for the international variations are historical, economic, and political, but one message from child development research has reached almost every parent and politician worldwide—young children are amazingly capable and eager to learn.

Homes and Schools

Developmental research does not translate directly into specific practices in early education, so no program can legitimately claim to be exactly what Piaget or Vygotsky would prescribe (Hatch, 2012). It seems fair to say that developmental theories and understanding of children can inspire educators, suggest hypotheses, and advance ideas, but applications to each child depend on analysis and reflection.

Beyond the amazing potential of young children to learn, another robust conclusion from research on children's learning seems not yet universally understood: Quality matters (Gambaro et al., 2014). If the home learning environment is poor, a good preschool program aids health, cognition, and social skills. If, instead, a family provides excellent education, children still may benefit from attending a high-quality preschool, but not as much as less fortunate children.

Indeed, it is better for children to be in excellent home care than in a low-quality, overcrowded day-care center. One expert criticizes inadequate subsidies that result in low-quality care: "Parents can find cheap babysitting that's bad for their kids on their own. They don't need government help with that (Barnett, quoted in Samuels & Klein, 2013, p. 21).

Quality is difficult to judge, and competition does not necessarily improve it: "[B]ecause quality is hard for parents to observe, competition seems dominated by price." To save money and make a profit, programs hire fewer teachers—so saving money may reduce quality (Gambaro et al., 2014, p. 22).

The United States has some excellent early-childhood programs, but most are not that good (Magnuson & Waldfogel, 2014). It is a mistake to conclude that mother care is better than care by another relative or nonrelative, or vice versa. Some mothers are fabulous, others disastrous. The same is true for fathers, grandmothers, day-care centers (unless strictly regulated by the government), and so on.

Quality cannot be judged by the name of a program or by its sponsorship. Educational institutions for 3- to 5-year-olds are called preschools, nursery schools, day-care centers, pre-primary programs, pre-K classes, and kindergartens. Sponsors can be public (federal, state, or city), private, religious, or corporate. Further, children, parents, and cultures differ, so an excellent program for one child might be less effective for another.

Professional assessment of quality also seems inadequate, if the goal of preschool is to further math, reading, and social skills (Sabol et al., 2013). However, one aspect—child-teacher interaction—does correlate with more learning. A bad sign is a teacher who sits and watches; look for teachers who talk, laugh, guide, and play with the children.

In order to sort through this variety, we review here some of the distinctions among types of programs. One broad distinction concerns the program goals. Is

it designed to encourage creative individuality, in which case it may be called *child-centered;* or is it to prepare the child for formal education, in which case it may be called *teacher-directed;* or is it to give skills to low-SES children so they can learn in school, in which case it is an intervention program (such as *Head Start*).

Child-Centered Programs

Many programs are called *child-centered,* or *developmental,* because they stress each child's development and growth. Teachers in such programs believe children need to follow their own interests rather than adult directions. For example, they agree that "children should be allowed to select many of their own activities from a variety of learning areas that the teacher has prepared" (Lara-Cinisomo et al., 2011). The physical space and the materials (such as dress-up clothes, art supplies, puzzles, blocks, and other toys) are arranged to allow exploration.

Most child-centered programs encourage artistic expression. Some educators argue that young children are gifted in seeing the world more imaginatively than older people do. According to advocates of child-centered programs, this peak of creative vision should be encouraged; children need many opportunities to tell stories, draw pictures, dance, and make music for their own delight.

That does not mean that academics are ignored. Advocates of math learning, for instance, believe that children have a natural interest in numbers and that child-centered schools can guide those interests as children grow (Stipek, 2013).

Child-centered programs are often influenced by Piaget, who emphasized that each child will discover new ideas if given a chance, or by Vygotsky, who thought that children learn from other children, with adult guidance. Some childhood educators believe that Piaget and Vygotsky advocate opposite approaches, with Piaget less likely to want the teacher to guide and instruct the child. Both, however, seek to bring out the child's inner strengths, so both can be considered child-centered.



"We teach them that the world can be an unpredictable, dangerous, and sometimes frightening place, while being careful not to spoil their lovely innocence. It's tricky."

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Tricky Indeed Young children are omnivorous learners, picking up habits, curses, and attitudes that adults would rather not transmit. Deciding what to teach—by actions more than words—is essential.

Especially for Teachers In trying to find a preschool program, what should parents look for? (see response, page 301)

Especially for Unemployed Early-Childhood Teachers You are offered a job in a program that has ten 3-year-olds for every one adult. You know that is too many, but you want a job. What should you do? (see response, page 301)



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Tibet, China, India, and . . . Italy? Over the past half-century, as China increased its control of Tibet, thousands of refugees fled to northern India. Tibet traditionally had no preschools, but young children adapt quickly, as in this preschool program in Ladakh, India. This Tibetan boy is working on a classic Montessori board.

Montessori Schools

One type of child-centered school began in the slums of Rome in 1907, when Maria Montessori opened a nursery school (Standing, 1998). She believed that children needed structured, individualized projects to give them a sense of accomplishment. Her students completed puzzles, used sponges and water to clean tables, traced shapes, and so on.

Montessori schools Schools that offer early-childhood education based on the philosophy of Maria Montessori, which emphasizes careful work and tasks that each young child can do.

Contemporary **Montessori schools** still emphasize individual pride and achievement, presenting many literacy-related tasks (e.g., outlining letters and looking at books) to young children. Specific materials differ from those that Montessori developed, but the underlying philosophy is the same. Children seek out learning tasks; they do not sit quietly in groups while a teacher instructs them. That makes Montessori programs child-centered (Lillard, 2013).

This philosophy seems to work. A study of 5-year-olds in inner-city Milwaukee who were chosen by lottery to attend Montessori programs found that the children were advanced in prereading (such as recognizing letters), math, and theory of mind, compared with their peers in other schools (Lillard & Else-Quest, 2006).

Some benefits became more apparent by middle school (a phenomenon called a *sleeper effect*, because the benefits seem to hibernate for a while) (Lillard, 2013). The probable explanation: Montessori tasks lead to self-confidence, curiosity, and exploration, which eventually motivate children to learn to read, calculate, and so on.

Reggio Emilia

Another form of early-childhood education is **Reggio Emilia,** named after the town in Italy where it began. In Reggio Emilia, children are encouraged to master skills that are not usually taught in North American schools until age 7 or so, such as writing and using tools (hammers, knives, and so on).

Reggio Emilia A program of early-childhood education that originated in the town of Reggio Emilia, Italy, and that encourages each child's creativity in a carefully designed setting.

Reggio schools do not provide large-group instruction, with lessons in, say, forming letters or cutting paper. Instead, "Every child is a creative child, full of potential" (Gandini et al., 2005, p. 1), with personal learning needs and artistic drives. Measurement of achievement, such as standardized testing to see whether children recognize the 26 letters of the alphabet, is antithetical to the conviction that each child should explore and learn in his or her own way. Each child's learning is documented via scrapbooks, photos, and daily notes—not to measure progress, but to help the child and the parent take pride in accomplishments (Caruso, 2013).

Appreciation of the arts is evident. Every Reggio Emilia school originally had a studio, an artist, and space to encourage creativity (Forbes, 2012). Consequently, as more schools in many nations follow the Reggio Emilia model, they all should have a large central room with many hubs of activity and a low child/adult ratio. Children's art is displayed on white walls and hung from high ceilings, and floor-

// Response for Immigrant Parents (from page 297): Children learn by listening, so it is important to speak with them often. Depending on how comfortable you are with the new language, you might prefer to read to your children, sing to them, and converse with them primarily in your native language and find a good preschool where they will learn the new language. The worst thing you could do would be to restrict speech in either tongue.



ELIZABETH FLORES KRT/NEWSCOM

Child-Centered Pride How could Rachel Koepke, a 3-year-old from a Wisconsin town called Pleasant Prairie, seem so pleased that her hands (and cuffs) are blue? The answer arises from northern Italy—Rachel attended a Reggio Emilia preschool that encourages creative expression.

to-ceiling windows open to a spacious, plant-filled playground. Big mirrors are part of the schools' décor—again, with the idea of fostering individuality and self-expression. However, individuality does not mean that children do not work together. On the contrary, group projects are encouraged.

Often those group projects include exploring some aspect of the natural world. One analysis of Reggio Emilia in the United States found "a science-rich context that triggered and supported preschoolers' inquiries and effectively engaged preschoolers' hands, heads, and hearts with science" (Inan et al., 2010, p. 1186)

Teacher-Directed Programs

Teacher-directed preschools stress academics, often taught by one adult to the entire group. The curriculum includes learning the names of letters, numbers, shapes, and colors according to a set timetable; every child naps, snacks, and goes to the bathroom on schedule as well. Children learn to sit quietly and listen to the teacher. Praise and other reinforcements are given for good behavior, and time-outs (brief separation from activities) are imposed to punish misbehavior.

In teacher-directed programs, the serious work of schooling is distinguished from the unstructured play of home. According to a study of preschool educators, some teachers endorse ideas that indicate their teacher-directed philosophy, such as that children should form letters correctly before they are allowed to write a story (Lara-Cinisomo et al., 2011).

The goal of teacher-directed programs is to make all children "ready to learn" when they enter elementary school. For that reason, basic skills are stressed, including precursors to reading, writing, and arithmetic, perhaps through teachers asking questions that children answer together in unison. Behavior is also taught, as children learn to respect adults, to follow schedules, to hold hands when they go on outings, and so on.

Children practice forming letters, sounding out words, counting objects, and writing their names. If a 4-year-old learns to read, that is success. (In a child-centered program, that might arouse suspicion that there was too little time to play



Learning from One Another Every nation creates its own version of early education. In this scene at a nursery school in Kuala Lumpur, Malaysia, note the head coverings, uniforms, and distance between the sexes. None of these elements would be found in most early-childhood-education classrooms in North America or Europe.

Response for Teachers (from page 299): Tell parents to look at the people more than the program. Parents should see the children in action and note whether the teachers show warmth and respect for each child.

Response for Unemployed Early-Childhood Teachers (from page 299): It would be best for you to wait for a job in a program where children learn well, organized along the lines explained in this chapter. You would be happier, as well as learn more, in a workplace that is good for children. Realistically, though, you might feel compelled to take the job. If you do, change the child/adult ratio—find a helper, perhaps a college intern or a volunteer grandmother. But choose carefully—some adults are not helpful at all. Before you take the job, remember that children need continuity: You can't leave simply because you find something better.

or socialize.) Good behavior, not informal social interaction, is rewarded—leading one critic to suggest that "readiness" is too narrowly defined (Winter, 2011).

Many teacher-directed programs were inspired by behaviorism, which emphasizes step-by-step learning and repetition, with reinforcement (praise, gold stars, prizes) for accomplishment. Another inspiration for teacher-directed programs comes from information-processing research indicating that children who have not learned basic vocabulary and listening skills by kindergarten often fall behind in primary school. Many state legislatures mandate that preschoolers master specific concepts, an outcome best achieved by teacher-directed learning (Bracken & Crawford, 2010).

Comparing Child-Centered and Teacher-Directed Programs

Most developmentalists advocate child-centered programs. They fear that the child's joy and creativity will be squashed if there are specific goals set for all children. As Penelope Leach wrote: "Goals come from the outside. . . . It is important that people see early learning as coming from inside children because that's what makes clear its interconnectedness with play, and therefore the inappropriateness of many 'learning goals'" (Leach, 2011, p. 17).

Many developmentalists resist legislative standards and academic tests for young children, arguing that social skills and creative play are essential for healthy development but difficult to measure. (**Developmental Link:** Children's play is discussed in Chapter 10.) Finding the right balance between formal and informal assessment, and between child-centered and teacher-directed learning, is a goal of many educators as they try to ensure that each child has the learning environment that works best for him or her (Fuligni et al., 2012).

Teachers' classroom behaviors do not necessarily follow what developmentalists recommend (Tonyan et al., 2013). Even teachers who say they are child-centered—especially if they are novice teachers—tend to be quite teacher-directed. They might tell children what to do instead of asking them their ideas. Teachers with more experience or training are more often consistent in belief and behavior—and teacher-directed (Wen et al., 2011).

The pressure for teachers to instruct, not facilitate, also comes from many parents. Those who are immigrants from Africa, Asia, and Latin America are particularly likely to want their children to learn academic skills and respect adult authority. Thus, they often seek teacher-directed preschools instead of child-centered ones. That may explain enrollment statistics from Norwegian preschools, which tend to be child-centered. Although Norwegian schools are free beginning at age 1, among immigrants, 92 percent of Western European, North American, and Australian 1- to 5-year-olds attend, compared to only 70 percent of those from other continents (Ellingsaeter, 2014).

Cultural differences may be crucial. Historically in China, teacher-directed curricula were the norm, with expectations for basic skills that every child should learn. Preschool children still wear uniforms, follow schedules, and so on, all set by the teachers and higher authorities, in accord with the culture. Recently, the Chinese government decided that young children needed to be more creative (Vong, 2013). However, implementation of creativity in China is not what a North American teacher would expect.

One teacher thought she was following that new directive by allowing the children to draw their own pictures. First, she fried an egg in view of the class and asked the children to draw an egg. "Most children drew a big one and colored the centre of the egg a bright yellow color. Some drew several small ones. When a child mixed yellow with white colors, the teacher corrected her" (Vong, 2013, p. 185).

Preparing for School

Several programs designed for children from low-SES families were established in the United States decades ago. Some solid research on the results of these programs is now available.

Head Start

In the early 1960s, millions of young children in the United States were thought to need a "head start" on their formal education to foster better health and cognition before first grade. Consequently since 1965, the federal government has funded a massive program for 4-year-olds called **Head Start.**

Head Start A federally funded early-childhood intervention program for low-income children of preschool age.

The goals for Head Start have changed over the decades, from lifting families out of poverty to promoting literacy, from providing dental care and immunizations to teaching Standard English. Although initially most Head Start programs were child-centered, they have become increasingly teacher-directed as waves of legislators have approved and shaped them. Children learn whatever their Head Start teachers and curricula emphasize. Not surprisingly, specific results vary by program and cohort.

For example, many low-income 3- and 4-year-olds in the United States are not normally exposed to math. After one Head Start program engaged children in a board game with numbers, their mathematical understanding advanced significantly (Siegler, 2009).

A 2007 congressional reauthorization of funding for Head Start included a requirement for extensive evaluation to answer two questions:

1. What difference does Head Start make to key outcomes of development and learning (in particular, school readiness) for low-income children? How does Head Start affect parental practices?
2. Under what circumstances and for whom does Head Start achieve the greatest impact?

The answers were not as dramatic as either advocates or detractors had hoped (U.S. Department of Health and Human Services, 2010). Head Start improved literacy and math skills, oral health, and parental responsiveness during early childhood. However, many academic benefits faded by first grade.

One explanation is that, unlike when Head Start began, many children in the comparison group were enrolled in other early-childhood programs—sometimes excellent ones, sometimes not. Another explanation is the elementary schools for low-SES children were of low quality, so the Head Start children sank back to the norm.

The research found that benefits were strongest for children with the lowest family incomes, for those living in rural areas, and for those with disabilities (U.S. Department of Health and Human Services, 2010). These children were least likely to find other sources of early education. Most Head



Disaster Recovery The success of Head Start led to Early Head Start for children such as this 2-year-old in Biloxi, Mississippi. When Hurricane Katrina destroyed most of the community, it was the first educational program to reopen. Since a family is a system, not just a collection of individuals, this Head Start program is helping parents as well as entire families recover.

Start children advanced in language and social skills, but by elementary school, the comparison children often caught up, with one exception: Head Start children were still ahead in vocabulary.

That finding also supports what you know about language development. Any good preschool will introduce children to words they would not learn at home. Children will fast-map those words, gaining a linguistic knowledge base that facilitates expanded vocabulary throughout life.

A recent study of children born in 2001 found that those who went to Head Start were advanced in math and language, but, compared to similar children who had only their mother's care, they had more behavior problems, according to their teachers (R. Lee et al., 2014). Of course, one interpretation of that result is that the teachers reacted negatively to the self-assertion of the Head Start children, rating the children's attitude a problem when really it was the teachers who had the problem.

National data have discovered something that even defenders of Head Start find problematic. Many Hispanic children are from low-income families and hence eligible for Head Start. However, relatively few of them participate.

There are many plausible reasons for this. One reason is fear of deportation. Although almost all young Latinos are citizens, their parents might be afraid that enrolling them would jeopardize other members of the family. Another reason is that the parents may be unaware of the educational benefits of preschool education. A third reason may be that, since few Head Start teachers speak Spanish, parents and teachers have difficulty communicating, so parents stay away. For whatever reason, many children from Spanish-speaking homes avoid preschool and enter kindergarten with poor English language skills, creating problems that are discussed in Chapters 12 and 15.

Long-Term Gains from Intensive Programs

This discussion of philosophies, practices, and programs may give the impression that the research on early-childhood cognition is contradictory. That is not true. Specifics are debatable, but empirical evidence and longitudinal evaluation find that preschool education advances learning. Ideally, each program has a curriculum that guides practice, all the adults collaborate, and experienced teachers respond to each child.

The best evidence comes from three longitudinal programs that enrolled children for years, sometimes beginning with home visits in infancy, sometimes continuing in after-school programs through first grade. One program, called *Perry* (or *High/Scope*), was spearheaded in Michigan (Schweinhart & Weikart, 1997); another, called *Abecedarian*, got its start in North Carolina (Campbell et al., 2001); a third, called *Child–Parent Centers*, began in Chicago (Reynolds, 2000). Because of the political context that existed when these programs began, all were focused on children from low-SES families.

All three programs compared experimental groups of children with matched control groups and reached the same conclusion: Early education has substantial long-term benefits that become most apparent when children are in the third grade or later. By age 10, children who had been enrolled in any one of these three programs scored higher on math and reading achievement tests than did other children from the same backgrounds, schools, and neighborhoods. They were less likely to be placed in special classes for children with special needs or to repeat a year of school.

An advantage of decades of longitudinal research is that teenagers and adults who received early education can be compared with those who did not. For all three programs, early investment paid off. In adolescence, the children who had

undergone intensive preschool education had higher aspirations, possessed a greater sense of achievement, and were less likely to have been abused. As young adults, they were more likely to attend college and less likely to go to jail. As middle-aged adults, they were more often employed, paying taxes, healthy, and not needing government subsidies (Reynolds & Ou, 2011; Schweinhart et al., 2005; Campbell et al., 2014).

All three research projects found that providing direct cognitive training, with specific instruction in various school-readiness skills, was useful. Each child's needs and talents were considered—a circumstance made possible because the child/adult ratio was low. This combined child-centered and teacher-directed programs, with all the teachers trained together and cooperating, so children were not confused. Teachers involved parents in their children's education, and each program included strategies to enhance the home–school connection.

These programs were expensive (ranging from $6,000 to $18,000 annually per child in 2014 dollars). From a developmental perspective, the decreased need for special education and other social services later on made early education a "wise investment" (Duncan & Magnuson, 2013, p. 128). Additional benefits to society over the child's lifetime, including increased employment and tax revenues, as well as reduced crime, are worth much more than the cost of the programs.

The greatest lifetime return came from boys from high-poverty neighborhoods in the Chicago preschool program: The social benefit over their lifetime was more than 12 times the cost (Reynolds et al., 2011). Unfortunately costs are immediate and benefits are long-term. Consequently, some legislators and voters are unwilling to fund expensive intervention programs that do not pay off until decades later.

That may be changing. In some nations, preschool education is now considered a right, not a privilege: Young children from families of all incomes are educated without cost to the parents. Beyond those nations already mentioned, many others offer everyone some free preschool or give parents a child-care subsidy. For example, England provides 15 free hours per week, New Zealand 20, and Canada pays $100 a month for each child under age 6.

Among developed nations, the United States is an outlier, least likely to support new mothers or young children. However in the past decade, some states (e.g., Oklahoma, Georgia, Florida, New Jersey, and Illinois) and some cities (e.g., New York, Boston, Cleveland, San Antonio, Los Angeles) have offered preschool to every 4-year-old. Although this investment generally results in fewer children needing special education later on, implementation and results are controversial—a topic for further research.

As of 2012, 40 states sponsored some public education for young children—usually only for 4-year-olds. In 2012–2013, more than a million children (1,338,737) attended state-sponsored preschools, including Head Start. That is 28 percent of all 4-year-olds, twice as many as a decade earlier (Barnett et al., 2013).

Most state programs pay only for children living in poverty, but many wealthy families pay tuition for preschool education. Private schools may be very expensive—as much as $30,000 a year. Not surprisingly, in the United States, families in the highest income quartile are more likely to have their 3- and 4-year-olds in an educational program (see Visualizing Development, p. 306).

The increases in preschool for 4-year-olds is good news, but developmentalists wish more younger children were in good preschools. In contrast to years past, much more is known about what young children can learn; 2- and 3-year-olds are capable of learning languages, concepts, and much else. What a child learns before age 6 is pivotal for later schooling and adult life. The amazing potential of young children is also a theme of the next chapter, where we discuss other kinds of learning—in emotional regulation, social skills, and more.

VISUALIZING DEVELOPMENT

Early-Childhood Schooling

Preschool can be an academic and social benefit to children. Around the world, increasing numbers of children are enrolled in early-childhood-education programs.

Early-childhood-education programs are described as "teacher-directed" or "child-centered," but in reality, most teachers' styles reflect a combination of both approaches. Some students benefit more from the order and structure of a teacher-directed classroom, while others work better in a more collaborative and creative environment.

TEACHER-DIRECTED APPROACH

Focused on Getting Preschoolers Ready to Learn

Direct instruction
Teacher as formal authority
Students learn by listening
Classroom is orderly and quiet
Teacher fully manages lesssons
Fosters autonomy of each individual
Encourages academics
Students learn from teacher

CHILD-CENTERED APPROACH

Focused on Individual Development and Growth

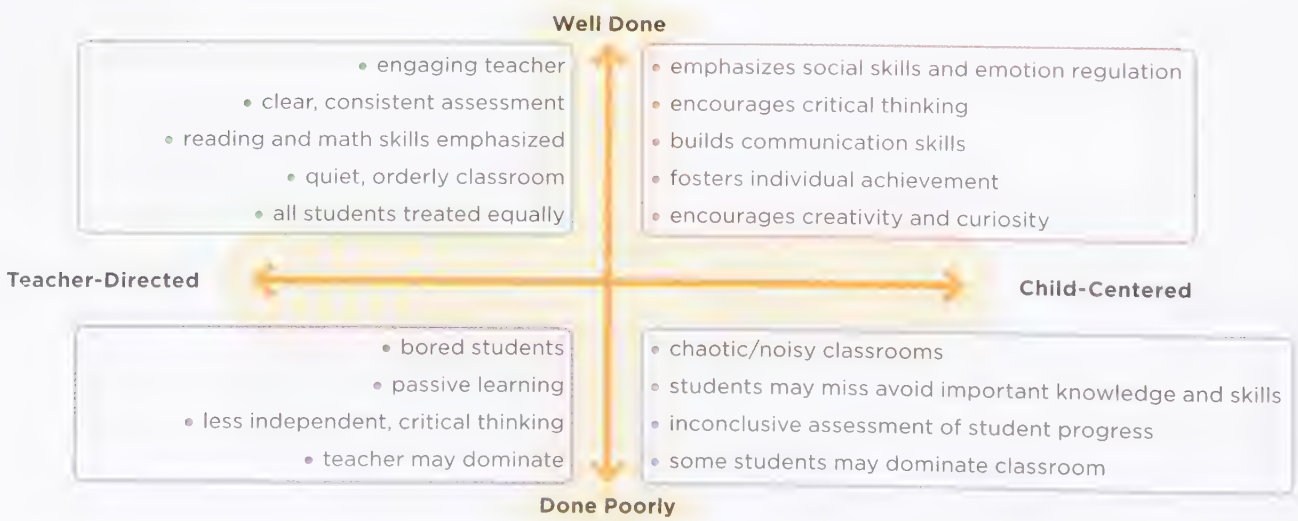
Teacher as facilitator
Teacher as delegator
Students learn actively
Classroom is designed for collaborative work
Students influence content
Fosters collaboration among students
Encourages artistic expression
Students learn from each other



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DIFFERENT STUDENTS, DIFFERENT TEACHERS

There is clearly no "one right way" to teach children. Each approach has potential benefits and pitfalls. A classroom full of creative, self-motivated students can thrive when a gifted teacher acts as a competent facilitator. But students who are distracted or annoyed by noise, or who are shy or intimidated by other children, can blossom under an engaging and encouraging teacher in a more traditional environment.



SOURCES & CREDITS LISTED ON P. SC-1

SUMMING UP Young children can learn a great deal before kindergarten, in either a child-centered or teacher-directed preschool, or in an excellent home setting. Montessori and Reggio Emilia schools advance children's learning. Both emphasize individual accomplishments and child development, with emphasis on creativity and exploration.

Teacher-directed programs stress readiness for school and teach letters and numbers that all children should know, as well as proper student behavior. Head Start and other programs are designed to advance learning for low-income children. Longitudinal research finds that some of the benefits of preschool programs are evident in adulthood. However, quality and accessibility are variable. The best programs are expensive; the benefits are apparent only decades later.

WHAT HAVE YOU LEARNED?

1. What do most preschools provide that most homes do not?
2. In child-centered programs, what do the teachers do?
3. What makes the Reggio Emilia program different from most other preschool programs?
4. Why are Montessori schools still functioning, 100 years after the first such schools opened?
5. What are the advantages and disadvantages of teacher-directed preschools?
6. What are the goals of Head Start?
7. What are the long-term results of intervention preschools?

SUMMARY

Thinking During Early Childhood

1. Piaget stressed the egocentric and illogical aspects of thought during early childhood. He called this stage of thinking preoperational intelligence because young children do not yet use logical operations to think about their observations and experiences.
2. Young children, according to Piaget, sometimes focus on only one thing (centration) and see things only from their own viewpoint (egocentrism), remaining stuck on appearances and current reality. They may believe that living spirits reside in inanimate objects and that nonhuman animals have the same characteristics they themselves have, a belief called animism.
3. Vygotsky stressed the social aspects of childhood cognition, noting that children learn by participating in various experiences, guided by more knowledgeable adults or peers. Such guidance assists learning within the zone of proximal development, which encompasses the knowledge children are close to understanding and the skills they can almost master.
4. According to Vygotsky, the best teachers use various hints, guidelines, and other tools to provide a child with a scaffold for new learning. Language is a bridge that provides social mediation between the knowledge that the child already has and the learning that society hopes to impart. For Vygotsky, words are tools for learning.
5. Children develop theories, especially to explain the purpose of life and their role in it. One theory about children's thinking is called "theory-theory"—the hypothesis that children develop theories because all humans innately seek explanations for everything they observe.
6. An example of the developing cognition of young children is theory of mind—an understanding of what others may be thinking. Theory of mind begins at around age 4, partly the result of maturation of the brain. Culture and experiences also influence its development.

Language Learning

7. Language develops rapidly during early childhood, a sensitive period but not a critical one for language learning. Vocabulary increases dramatically, with thousands of words added between ages 2 and 6. In addition, basic grammar is mastered.
8. Many children learn to speak more than one language, gaining cognitive as well as social advantages. Early childhood is the best time to learn two languages. The benefits of bilingualism are lifelong.

Early-Childhood Schooling

9. Organized educational programs during early childhood advance cognitive and social skills, although specifics vary a great deal. Quality of a program cannot be judged by the name or by appearance.
10. Montessori and Reggio Emilia are two child-centered programs that began in Italy and are now offered in many nations. They stress individual interests of each child, including creative play, inspired by Piaget and Vygotsky.
11. Behaviorist principles led to many specific practices of teacher-directed programs. Children learn to listen to teachers and become ready for kindergarten.
12. Head Start is a U.S. federal government program primarily for low-income children. Longitudinal research finds that early-childhood education reduces the risk of later problems, such as needing special education. High-quality programs increase the likelihood that a child will become a law-abiding, gainfully employed adult.
13. Many types of preschool programs are successful. It is the quality of early education that matters. Children learn best if teachers follow a defined curriculum and if the child/adult ratio is low. The training, warmth, and continuity of early-childhood teachers benefit the children in many ways.

KEY TERMS

preoperational intelligence (p. 277)
symbolic thought (p. 278)
animism (p. 278)
centration (p. 278)
egocentrism (p. 278)
focus on appearance (p. 278)
static reasoning (p. 278)
irreversibility (p. 279)
conservation (p. 279)
scaffolding (p. 282)
overimitation (p. 283)
private speech (p. 284)
social mediation (p. 284)
theory-theory (p. 286)
theory of mind (p. 287)
fast-mapping (p. 292)
overregularization (p. 294)
pragmatics (p. 294)
Montessori schools (p. 300)
Reggio Emilia (p. 300)
Head Start (p. 303)

APPLICATIONS

The best way to understand thinking in early childhood is to listen to a child, as applications 1 and 2 require. If some students have no access to children, they should do application 3 or 4.

1. Replicate one of Piaget's conservation experiments. The easiest one is conservation of liquids (Figure 9.1). Work with a child under age 5 who tells you that two identically shaped glasses contain the same amount of liquid. Then carefully pour one glass of liquid into a narrower, taller glass. Ask the child if one glass now contains more or if the glasses contain the same amount.
2. To demonstrate how rapidly language is learned, show a preschool child several objects and label one with a nonsense word the child has never heard. (*Toma* is often used; so is *wug*.) Or choose a word the child does not know, such as *wrench*, *spatula*, or the name of a coin from another nation. Test the child's fast-mapping.
3. Theory of mind emerges at about age 4, but many adults still have trouble understanding other people's thoughts and motives. Ask several people why someone in the news did whatever he or she did (e.g., a scandal, a crime, a heroic act). Then ask your informants how sure they are of their explanation. Compare and analyze the reasons as well as the degrees of certainty. (One person may be sure of an explanation that someone else thinks is impossible.)
4. Think about an experience in which you learned something that was initially difficult. To what extent do Vygotsky's concepts (guided participation, zone of proximal development) explain the experience? Write a detailed, step-by-step account of your learning process as Vygotsky would have described it.



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CHAPTER 10



Early Childhood: Psychosocial Development

What Will You Know?

1. Why do 2-year-olds have more sudden tempers, tears, and terrors than 6-year-olds?
2. If a child never plays, is that a problem?
3. Should girls play with trucks and boys with dolls?
4. What happens if you never punish a child?

- Emotional Development
  - Initiative Versus Guilt
  - Motivation
  - Culture and Emotional Control
  - Seeking Emotional Balance
- Play
  - Playmates
  - Culture and Cohort
  - Active Play
- Challenges for Caregivers
  - Caregiving Styles
  - Cultural Variations
  - Becoming Boys or Girls: Sex and Gender
  - Theories of Gender Development
  - A CASE TO STUDY: My Daughters
- Moral Development
  - Nature and Nurture
  - Empathy and Antipathy
  - Good Behavior
  - Discipline
  - OPPOSING PERSPECTIVES: Is Spanking Okay?

It was a hot summer afternoon. Rachel, almost 3, and Bethany, age 4, were with me in the kitchen, which was in one corner of our living/dining area. Rachel opened the refrigerator and grabbed a glass bottle of orange juice. The sticky bottle slipped, shattering on the tile floor. My stunned daughters looked at me, at the shards, at the spreading juice with extra pulp. I picked my girls up and plopped them on the couch.

"Stay there," I yelled.

They did, quiet, wide-eyed, and puzzled at my loud fury. Rachel had not deliberately dropped the juice, and Bethany had done nothing wrong, but they both knew that sometimes I demanded unquestioning obedience and they saw the signs that this was one of those times.

As they watched me pick, sweep, and mop, I understood how parents could hit their kids. By the end of this chapter, I hope you also realize that a moment like this—in the summer heat, with two small children causing unexpected work—can turn a loving, patient parent into something else. It is not easy, day after day, being the guide and model that parents should be.

Fortunately, many safeguards prevented me from serious maltreatment: The girls had learned when to obey, I knew not to punish in anger—our shared morality kept discipline within bounds. I hugged them when I took them off the couch. As children learn to manage their emotions, as parents learn to guide their children, as the macrosystem and microsystem (beliefs and income) influence adult–child interaction, many aspects of psychosocial development affect how children develop from ages 2 to 6. This chapter describes all that.

Emotional Development

Children gradually learn when and how to express emotions, becoming more capable in every aspect of their lives. Controlling the expression of emotions, called **emotional regulation,** is the preeminent psychosocial task between ages 2 and 6. Emotional regulation is a lifelong endeavor, affected by temperament and time, but early childhood is a

emotional regulation The ability to control when and how emotions are expressed.



A Poet and We Know It She is the child winner of a national poetry contest. Is she as surprised, humbled, and thankful as an adult winner would be?

effortful control The ability to regulate one's emotions and actions through effort not simply through natural inclination.

initiative versus guilt Erikson's third psychosocial crisis, in which children undertake new skills and activities and feel guilt when they do not succeed at them.

self-concept A person's understanding of who he or she is, in relation to self-esteem, appearance, personality, and various traits.

OBSERVATION QUIZ Does this mother deserve praise? (see answer, page 315)



crucial period for its development (Gross, 2014; Lewis, 2013). Difficulty with emotional regulation predicts many psychosocial problems later on.

Such regulation is virtually impossible in infancy, but when the emotional hot spots of the limbic system connect to the prefrontal cortex, children become better able to control their reactions. This is not easy; it requires practice, maturation, and work, called **effortful control** (Eisenberg et al., 2014).

By age 6, children can usually be angry but not explosive, frightened but not terrified, sad but not inconsolable, anxious but not withdrawn, proud but not boastful. Depending on each child's temperament, some emotions are easier to control than others, but even temperamentally angry or fearful children can learn to modify the expression of their emotions (Moran et al., 2013; Tan et al., 2013).

Emotional regulation is a lifelong necessity; no one does it perfectly all the time. When Rachel dropped the orange juice, I should not have yelled. Fortunately, my unregulated expression of anger stopped there. Learning to regulate emotion is a long process.

Initiative Versus Guilt

During Erikson's third developmental stage, **initiative versus guilt,** children acquire many skills and competencies in addition to emotional regulation. *Initiative* can mean several things—saying something new, expanding an ability, beginning a project. Depending on the outcome (especially reactions from other people), children feel proud or guilty.

Usually, North American parents encourage enthusiasm, effort, and pride in their 2- to 6-year-olds, and also prevent guilt from becoming self-hatred. If, instead, parents ignore rather than guide emotions, a child may not learn emotional regulation (Morris et al., 2007).

Protective Optimism

Adults may think that children should have an accurate view of their abilities. But that is not typical of preschool children, nor should it be. Children are proud of themselves, optimistically overestimating their prowess. That helps them try new things, which advances skills of all kinds. As Erikson predicted, their optimistic self-concept protects them from guilt and shame.

Children's beliefs about their worth require first a sense that they are a person (self-awareness, usually attained at 18 months), accompanied by lack of self-criticism. This flourishes with parental confirmation, especially when parents remind their children of their positive accomplishments ("You helped Daddy sweep the sidewalk. You made it very clean."

Remember that Erikson described autonomy at ages 1 and 2, a stage often characterized by stubbornness and nicknamed "the terrible twos." By age 3, autonomy is transformed to become initiative, as children act on their eagerness to learn new skills (Rubin et al., 2009). This chapter's opening anecdote is an example: Rachel was learning to get juice when she was thirsty. Both autonomy and initiative are more prized in Western cultures than in Eastern ones, where children learn to be socially attuned and interdependent (Keller & Otto, 2011).

Children in North America and Europe develop a strong **self-concept,** an understanding of themselves. For example, young children are given choices: "Apple or banana?" "Blue pajamas or red ones?" Choosing makes people believe they are

Similarity Testing? [illegible] but their actions [illegible] children gathered freshly laid eggs that [illegible] bins existed until tens of thousands of [illegible]

independent agents (Kim & Chu, 2011). Preschool children do not usually realize the limits of their choices, as my friend did when his 4-year-old daughter wanted him to make a valentine. He did not want to do it, but she gave him only two choices: a valentine for his mother or his wife.

In the United States, self-concept quickly includes gender and size. Girls are usually happy to be girls; boys to be boys; both are glad they aren't babies. "Crybaby" is an insult; praise for being "a big kid" is welcomed; pride in being able to do something better than a younger child is boasted out loud.

Erikson recognized that young children are not realistic. They believe that they are strong, smart, and good-looking—and thus that any goal is achievable. Whatever they are (self-concept) is thought to be good.

For instance, young children not only believe that their nation and religion are best; they feel sorry for children who do not belong to their country or church. At this age, a protective optimism encourages children to try unfamiliar activities, make friends, begin school, and so on (Boseovski, 2010). The same is true for mastering skills: They learn to pour juice, zip pants, and climb trees, undeterred by overflowing juice, stuck zippers, or a perch too high. Faith in themselves helps them persist.

Moreover, children are cognitively ready to understand group categories, not only of ethnicity, gender, and nationality, but even categories that are irrelevant, such as children whose names begin with the same letter. Such categories seem to be part of human thinking lifelong, so group identity appears spontaneously once the child is old enough. One amusing example occurred when preschoolers were asked to explain why one fictional creature would steal from another. They immediately suggested a reason, as you would expect from theory-theory.

> "Why did a Zaz steal a toy from a Flurp?"
> "Because he's a Zaz, but he's a Flurp. They're not the same kind. . . .
> "Why did a Zaz steal a toy from a Zaz?
> "Because he's a very mean boy."
>
> *[Rhodes, 2013, p. 259]*

Brain Maturation

The new initiative that Erikson describes results from myelination of the limbic system, growth of the prefrontal cortex, and a longer attention span—all the result of neurological maturation. (**Developmental Link:** Brain maturation is described in detail in Chapter 5 and Chapter 8.) Emotional regulation and cognitive maturation develop together, each enabling the other to advance (Bell & Calkins, 2011; Lewis, 2013).

Normally, neurological advances in the prefrontal cortex at about age 4 or 5 make children less likely to throw tantrums, pick fights, or giggle during prayer. Throughout early childhood, violent outbursts, uncontrolled crying, and terrifying *phobias* (irrational, crippling fears) diminish. The capacity for self-control, such as not opening a present immediately if asked to wait and not expressing disappointment at an undesirable gift, becomes more evident.



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Proud Peruvian In rural Peru, a program of early education (Pronoei) encourages community involvement and traditional culture. Preschoolers, like this girl in a holiday parade, are proud to be themselves, and that helps them become healthy and strong.

For example in one study, researchers asked children to wait 8 minutes while their mothers did some paperwork before opening a wrapped present in front of

LaunchPad



FADED NK NET/SHUTTERSTOCK

Video Activity: Can Young Children Delay Gratification illustrates how most young children are unable to overcome temptation even when promised a reward for doing so.

them (Cole et al., 2011). The children used strategies to help them wait, including distractions and private speech.

Keisha was one of the study participants:

> "Are you done, Mom?" . . . "I wonder what's in it" . . . "Can I open it now?"
>
> Each time her mother reminds Keisha to wait, eventually adding, "If you keep interrupting me, I can't finish and if I don't finish . . ." Keisha plops in her chair, frustrated. "I really want it," she laments, aloud but to herself. "I want to talk to mommy so I won't open it. If I talk, Mommy won't finish. If she doesn't finish, I can't have it." She sighs deeply, folds her arms, and scans the room. . . . The research assistant returns. Keisha looks at her mother with excited anticipation. Her mother says, "OK, now." Keisha tears open the gift.
>
> *[Cole et al., 2011, p. 59]*

According to a longitudinal study of preschoolers who managed to wait before eating a marshmallow in order to get two marshmallows, the ability to delay gratification correlates with success in adulthood (Mischel, 2014).

Motivation

Motivation (the impulse that propels someone to act) comes either from a person's own desires or from the social context.

intrinsic motivation A drive, or reason to pursue a goal, that comes from inside a person, such as the desire to feel smart or competent.

extrinsic motivation A drive, or reason to pursue a goal, that arises from the need to have one's achievements rewarded from outside, perhaps by receiving material possessions or another person's esteem.

Intrinsic motivation comes from within, when people do something for the joy of doing it: A musician might enjoy making music even when no one else hears it. Intrinsic motivation is thought to advance creativity, innovation, and emotional well-being (Weinstein & DeHaan, 2014).

Extrinsic motivation comes from outside, when people do something to gain praise or another reinforcement. A musician might play for applause or money. Humans seek such external rewards, but if the reward stops, the behavior stops.

Intrinsic motivation is crucial for young children, with almost all of them playing, questioning, and exploring for the sheer joy of it. That serves them well. A study found that 3-year-olds who were strong in intrinsic motivation were, two years later, especially strong in early math and reading skills (Mokrova et al., 2013).

Especially for College Students Is extrinsic or intrinsic motivation more influential in your study efforts? (see response, page 316)

Child-centered preschools, as described in Chapter 9, depend on the reality that children love to talk, play, and move. Praise and prizes might be appreciated, but that's not why children work at what they do. When playing a game, they might not keep score; the fun is in the activity (intrinsic), not the winning.

Intrinsic motivation is apparent when children invent dialogues for their toys, concentrate on creating a work of art or architecture, and converse with **imaginary friends.** Such conversations with invisible companions are rarely encouraged by adults (i.e., no extrinsic motivation), but from about age 2 to 7, imaginary friends are increasingly common. Children know their imaginary friends are pretend, but conjuring them up meets intrinsic needs (M. Taylor et al., 2009).

imaginary friends Make-believe friends who exist only in a child's imagination; increasingly common from ages 3 through 7. They combat loneliness and aid emotional regulation.

Especially for Teachers One of your students tells you about a child who plays, sleeps, and talks with an imaginary friend. Does this mean that that child is emotionally disturbed? (see response, page 316)

In a classic experiment designed to understand more about why children do what they do, preschool children were given markers and paper for drawing and assigned to one of three groups who received, respectively: (1) no award, (2) an expected award (they were told *before* they had drawn anything that they would get a certificate), and (3) an unexpected award (*after* they had drawn something, they heard, "You were a big help," and got a certificate) (Lepper et al., 1973).

Later, observers noted how often children in each group chose to draw on their own. Those who received the expected award were less likely to draw than those who were unexpectedly rewarded. The interpretation was that extrinsic motivation (condition #2) undercut intrinsic motivation.

This research triggered a flood of studies seeking to understand whether, when, and how positive reinforcement should be given. The consensus is that praising

or paying a person *after* an accomplishment sometimes encourages that behavior. However, if payment is promised in advance, that extrinsic reinforcement may backfire (Deci et al., 1999; Cameron & Pierce, 2002; Gottfried et al., 2009).

Praise is effective when it is connected to the particular production, not to a general trait. For example, the adult might say, "You did a good drawing," not "You are a great artist." The goal is to help the child realize that effort paid off, which motivates a repeat performance (Zentall & Morris, 2010).

In another set of experiments that suggest that specific praise for effort is better than generalized statements, some 4- to 7-year-old children were told that boys (or girls) are good at a particular game. Knowing that made their scores on the game lower than those of other children. They apparently feared that they would not be as good as most children of their age and sex. They "felt less happy and less competent, liked the game less, and were less persistent" (Cimpian, 2013, p. 272). By contrast, children who were told that one particular child was good at the game believed that personal effort mattered. That belief was motivating; their scores were higher than those told the general statement.

Especially for Teachers of Young Children
Should you put gold stars on children's work? (see response, page 317)

// ANSWER TO OBSERVATION QUIZ
(from page 312) Yes—even if you don't consider recycling important. Notice her face and body: She is smiling and kneeling, and her hands are on her legs, all suggesting that she knows how to encourage without interfering. Even more commendable is her boys' behavior: Many brothers would be grabbing, shoving, and throwing, but, at least at this moment, shared cooperation is evident. Kudos to Mom.

Culture and Emotional Control

As you know, cultural differences are apparent in every aspect of development. This is quite obvious in emotional expression. Children may be encouraged to laugh/cry/yell or the opposite, to hide those emotions. Some adults guffaw, slap their knees, and stomp their feet for joy; others cover their mouths with their hands if a smile spontaneously appears. Children learn to do the same.

Control strategies vary culturally as well. Peers, parents, and strangers sometimes ignore emotional outbursts, sometimes deflect them, sometimes punish them. Shame is used when social reputation is a priority. In some cultures, "pride goeth before a fall" and people who "have no shame" are considered mentally ill (Stein, 2006).

Finally, families, cultures, and nations differ as to which emotions most need to be regulated. Cohort changes and social stereotypes distort any attempt to link specific nations with the emotions each attempts to regulate, but the following illustrates the idea of cultural variations:

- Fear (United States)
- Anger (Iran)
- Pride (China)
- Selfishness (Japan)
- Impatience (many Native American communities)
- Defiance (Mexico)
- Moodiness (the Netherlands)

(Chen, 2011; Harkness et al., 2011; J. G. Miller, 2004; Stubben, 2001; Tahmouresi et al., 2014).

Temperaments vary, which makes people within the same culture unlike one another. "Cultures are inevitably more complicated than the framework that is supposed to explain them" (Harkness et al., 2011, p. 92). Nonetheless, parents everywhere teach emotional regulation, hoping their children will adapt to the norms of their culture, and cultures differ in which emotions are particularly unwelcome (Kim & Sasaki, 2014).



Learning Emotional Regulation Like this girl in Hong Kong, all 2-year-olds burst into tears when something upsets them—a toy breaks, a pet refuses to play, or it's time to go home. A mother who comforts them and helps them calm down is teaching them to regulate their emotions.

Seeking Emotional Balance

psychopathology Literally, an illness of the mind, or psyche. Various cultures and groups within cultures have different concepts of specific psychopathologies. A recent compendium of symptoms and disorders in the United States is in the DSM-5. Many other nations use an international set of categories, the ICD-10.

externalizing problems Difficulty with emotional regulation that involves expressing powerful feelings through uncontrolled physical or verbal outbursts, as by lashing out at other people or breaking things.

internalizing problems Difficulty with emotional regulation that involves turning one's emotional distress inward, as by feeling excessively guilty, ashamed, or worthless.

Universally, at every age, in all cultures and cohorts, caregivers try to prevent **psychopathology,** an illness or disorder (*-pathology*) of the mind (*psycho-*). Although symptoms and diagnoses are influenced by culture (rebellion is expected in some cultures and pathological in others), impaired emotional regulation signals mental imbalance everywhere. Parents guide young children toward "an optimal balance" between emotional expression and emotional control (Blair & Dennis, 2010; Trommsdorff & Cole, 2011).

Without adequate regulation, emotions are overwhelming. Intense reactions can occur in opposite ways, as you might expect from the activate/inhibit nature of neurons, as explained in Chapter 8.

Some people have **externalizing problems:** Their powerful feelings burst out uncontrollably. They externalize rage, for example, by lashing out or breaking things. Without emotional regulation, an angry child might pummel another person or lie down screaming and kicking. By age 5, children usually have learned more self-control, perhaps pouting or cursing, not hitting and screaming.

Other people have **internalizing problems:** They are fearful and withdrawn, turning distress inward. Emotions may be internalized via headaches or stomach aches. Although the cause is psychological, the ache is real. Girls tend to internalize and boys to externalize, although children of both sexes do both.

With maturity, the extreme fears of some 2-year-olds (e.g., terror of the bathtub drain, of an imagined tidal wave, of a stranger on crutches) diminish. The fear isn't gone, but expression is regulated. A frightened 2-year-old might hide in the closet; a 5-year-old might be afraid of kindergarten but will bravely let go of Mother's hand and enter the classroom.



KOICHI SAITO/AMANAIMAGE/AGE FOTOSTOCK

Age or Gender? Probably both. Brother and sister are reacting typically for their age and sex, as the 4-year-old boy moves his book away from his sister, who cries instead of grabbing it. Culture may be a factor, too, as these siblings are in Korea, where physical fighting between siblings is not allowed.

Both undercontrol, which produces externalizing behavior, and overcontrol, which leads to internalizing behavior, are much more common in 3-year-olds than in 5-year-olds. Experiences during those years interact with brain maturation, ideally strengthening emotional regulation (Lewis, 2013).

Sex differences in internalizing and externalizing behavior are traditionally assumed to be biological, perhaps hormonal, but a cultural explanation is also possible. Do parents and cultures teach young girls to restrain externalizing actions ("not ladylike"), while teaching boys to avoid crying ("be a man")? Trying to understand the causes of sex or gender differences is a concern of thousands of researchers (Eagly & Wood, 2013). Conflicting theories and evidence are presented

Response for College Students (from page 314): Both are important. Extrinsic motivation includes parental pressure and the need to get a good job after graduation. Intrinsic motivation includes the joy of learning, especially if you can express that learning in ways others recognize. Have you ever taken a course that was not required and was said to be difficult? That was intrinsic motivation.

Response for Teachers (from page 314): No, unless the child is over age 10. In fact, imaginary friends are quite common, especially among creative children. The child may be somewhat lonely, though; you could help him or her find a friend.

later in this chapter. In any case, unless they master emotional regulation during early childhood, boys tend to throw and hit and girls tend to sob or hide.

SUMMING UP Achieving emotional regulation is the crucial psychosocial task in early childhood. Erikson thought young children are naturally motivated to take initiative, with joy at new tasks. He also thought that during early childhood, guilt feelings may come to the fore, as parents criticize unrestrained emotional expression. As children develop their self-concept, motivation to do well increases as does the belief that one's own group (e.g., gender, nationality, ethnicity) is better than others. Brain maturation and family guidance help children regulate their emotions, avoiding either extreme externalizing or internalizing reactions. Universally, 2- to 6-year-olds become better able to control and express their emotions, but cultures differ in which emotions should be controlled and how emotions should be expressed.

WHAT HAVE YOU LEARNED?

1. How might protective optimism lead to a child's acquisition of new skills and competencies?
2. How would a child's self-concept affect his or her motivation?
3. What is an example of an intrinsic motivation for reading?
4. What is an example of an extrinsic motivation for reading?
5. What seem to be sex differences in externalizing and internalizing behavior?
6. What is the connection between psychopathology and emotional regulation?
7. What is universal and what is culture-specific in emotional expression?



Cute or Too Shy? Cute, of course. Universally, girls and women are expected to be reticent. They cling more to their mothers in kindergarten, they wait to be asked to dance or date, they talk less in co-ed groups. If she were a he, would he be considered too shy?

Play

Play is timeless and universal—apparent in every part of the world for thousands of years. Many developmentalists believe that play is the most productive as well as the most enjoyable activity that children undertake (Elkind, 2007; Bateson & Martin, 2013; P. K. Smith, 2010). Whether play is essential for normal growth or is merely fun is "a controversial topic of study" (Pellegrini, 2011, p. 3).

This controversy underlies many of the disputes regarding preschool education, which increasingly stresses academic skills. One consequence is that "play in school has become an endangered species" (Trawick-Smith, 2012, p. 259). Among the leading theorists of human development, Vygotsky is well known for his respect for child's play, which makes a playing child "a head taller" than their actual height (Vygotsky, 1980).

Some educators want children to play less in order to focus on reading and math; others predict emotional and academic problems for children who rarely play. It does seem that children who are deprived of activity for a long period tend to play more vigorously when they finally have the chance (Pellegrini et al., 2013), and that for children of all ages, taking a break from concentrated intellectual work enhances learning.

There are two general kinds of play, *pretend play* that often occurs by a child alone, and *social play*, that occurs when children are together. The idea that "pretend play is a crucial engine of child development" has been explored in hundreds of studies, carefully reviewed (Lillard et al., 2013, p. 24).

The reviewers do not confuse correlation with causation. They report that evidence is weak regarding pretend play, but they suggest that preventing social play will not only make children less happy, it may impair learning (Lillard et al., 2013). They conclude that play—especially social play—is one way that children develop their minds and social skills, although not the only way.

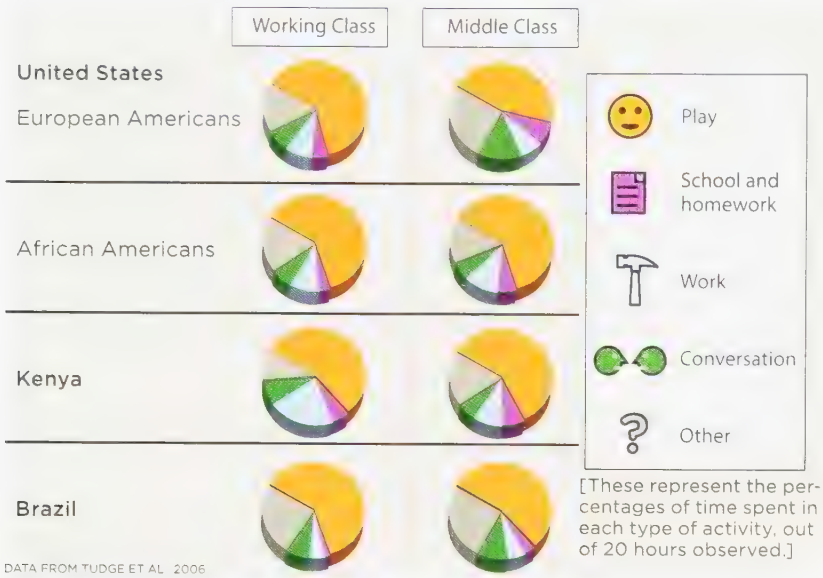
// **Response for Teachers of Young Children** (from page 315): Perhaps, but only after the work is completed and if the child has put genuine effort into it. You do not want to undercut intrinsic motivation, as happens with older students who know a particular course will be an "easy A."

VISUALIZING DEVELOPMENT

Less Play, Less Safe?

Play is universal—all young children do it when they are with each other, if they can. For children, play takes up more time than anything else, whether their family is rich or poor.

WHAT 3-YEAR-OLDS DO WITH THEIR TIME

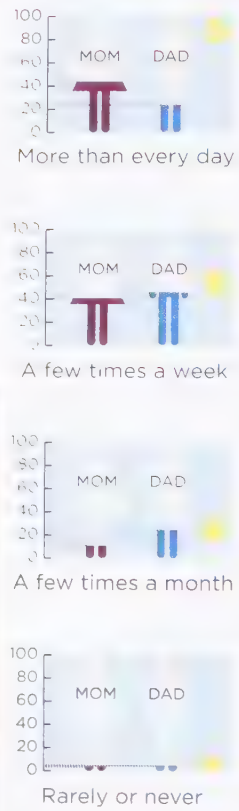


[These represent the percentages of time spent in each type of activity, out of 20 hours observed.]

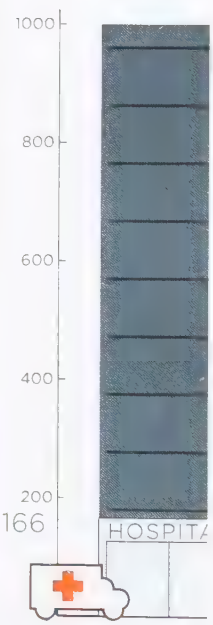
DATA FROM TUDGE ET AL. 2006

However, many developmentalists worry that active play has decreased as screen time has increased, especially in the United States (on average, 2.1 hours per day for 2- to 4-year-olds).

PERCENT OF KIDS WHOSE PARENTS PLAY OUTDOORS WITH THEM

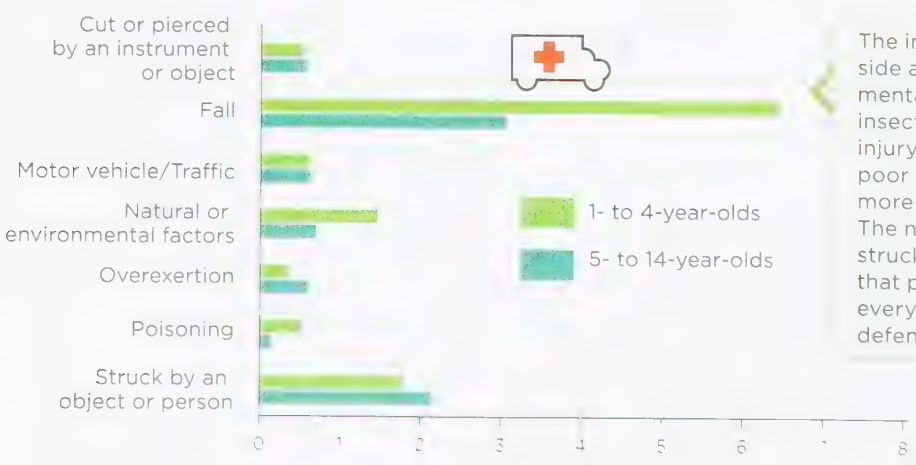


Parents worry that children will be injured if they play outside, but the data suggest the opposite. Only 166 out of every thousand children need to go to the emergency room per year, and almost all of those were injured in the home, or in a car.



From what kind of injuries do young children suffer?

Compare 1- to 4-year-olds and 5- to 14-year-olds



The injuries most likely to occur outside are lumped together as environmental or natural—usually animal or insect bites. And the most common injury, falls—which may result from poor balance and motor control—is more problematic for inactive children. The next most common injury is being struck by a person—almost always that person is an adult at home. At every age, physical fitness is the best defense against accidental injury.

DATA FROM EMERGENCY ROOM VISITS, 2009-2010. CHILDSTATS.GOV

Playmates

How, then, should children play? Young children play best with *peers*, that is, people of about the same age and social status. Although even infants are intrigued by other small children, most infant play is either solitary or with a parent. Some maturation is required for social play, which may advance brain development and creativity (Bateson & Martin, 2013).

Such an advance can be seen over the years of early childhood. Toddlers are too self-absorbed to be good playmates, but they learn quickly. By age 6, most children are quite skilled: Some know how to join a peer group, manage conflict, take turns, find friends, and keep playmates (Şendil & Erden, 2014; Göncü & Gaskins, 2011). As they become better playmates, they learn emotional regulation, empathy, and cultural understanding.

Parents have an obvious task: Find peers and arrange play dates. Of course, some parents play with their children, which benefits both of them. But even the most playful parent is outmatched by another child at negotiating the rules of tag, at play-fighting, at pretending to be sick, at killing dragons. Specifics vary, but "play with peers is one of the most important areas in which children develop positive social skills" (Xu, 2010, p. 496).

Culture and Cohort

All young children play; "everywhere, a child playing is a sign of healthy development" (Gosso, 2010, p. 95). Play is the favorite activity of young children, as illustrated in Visualizing Development, page 318. Basic play is similar in every culture: throwing and catching; chasing and exploring; pretending to be adults; drawing with chalk, felt pens, sticks, or anything that can make a mark. Accordingly, developmentalists think play is *experience-expectant*.

Some specifics are *experience-dependent*, however, reflecting culture and SES. (**Developmental Link:** Experience-expectant and experience-dependent brain development are explained in Chapter 5.) Chinese children fly kites, Alaskan Natives tell dreams and stories, Sami children of Scandinavia pretend to be reindeer, Cameroonian children hunt mice, and so on. Parents in some cultures consider play important and willingly engage in games and dramas. In other places, sheer survival takes time and energy, and children must help by doing chores. In those places, if children have any time for play, it is with each other, not with adults who spend all their energy on basic tasks (Kalliala, 2006; Roopnarine, 2011).

As children grow older, play becomes more social, influenced by brain maturation, playmate availability, and the physical setting. One developmentalist bemoans the twenty-first century's "swift and pervasive rise of electronic media" and adults who lean "more toward control than freedom" (Chudacoff, 2011, p. 108). He praises children who find places to play independently and "conspire ways to elude adult management."

This opinion may be extreme, but it is echoed in more common concerns. As you remember, one dispute in preschool education is the proper balance between unstructured, creative play and teacher-directed learning. Before the electronic age, and in places where technology was rare, most families had several children and few mothers worked outside the home. Then all children played outside with others, and groups often included children of several ages.



Play Ball! In every nation, young children play with balls, but the specific games they play vary with the culture. Soccer is the favorite game in many countries, including Brazil, where these children are practicing their dribbling on Copacabana Beach in Rio de Janeiro

OBSERVATION QUIZ Does kicking a soccer ball, as shown above, require fine or gross motor skills? (see answer, page 322)

That was true in the United States a century ago. In 1932, the American sociologist Mildred Parten described the development of five kinds of social play, each more advanced than the previous one:

1. *Solitary play:* A child plays alone, unaware of any other children playing nearby.
2. *Onlooker play:* A child watches other children play.
3. *Parallel play:* Children play with similar objects in similar ways but not together.
4. *Associative play:* Children interact, sharing material, but their play is not reciprocal.
5. *Cooperative play:* Children play together, creating dramas or taking turns.



No Grabbing Maybe the child on the left or the right will soon try to grab. If sharing continues, is it because these children have been raised within Asian families?

Parten thought that progress in social play was age-related, with 1-year-olds usually playing alone and 6-year-olds usually cooperatively.

Research on contemporary children finds much more age variation, perhaps because family size is smaller and parents invest heavily in each child. Many Asian parents teach 3-year-olds to take turns, share, and otherwise cooperate (stage 5). Many North American children, encouraged to be individuals, still engage in parallel play at age 6 (stage 3). Given all the social, political, and economic changes over the past century, many forms of social play (not necessarily in Parten's five-step sequence) are normal (Xu, 2010).

Active Play

Children need physical activity to develop muscle strength and control. Peers provide an audience, role models, and sometimes competition. For instance, running skills develop best when children chase or race each other, not when a child runs alone. Gross motor play is favored among young children, who enjoy climbing, kicking, and tumbling (Case-Smith & Kuhaneck, 2008).

Active social play—not solitary play—correlates with peer acceptance and a healthy self-concept and may help regulate emotions (Becker et al., 2014; Sutton-Smith, 2011). Adults need to remember this when they want children to sit still and be quiet. Among nonhuman primates, deprivation of social play warps later life, rendering some monkeys unable to mate, to make friends, or even to survive alongside other monkeys (Herman et al., 2011; Palagi, 2011). Is the same true for human primates?

Active play advances planning and self-control. Two-year-olds merely chase and catch each other, but older children keep the interaction fair, long lasting, and fun. In the game of tag, for instance, children set rules (adjusted to local terrains and dangers), and each child decides how far to venture from base. If one child is "it" for too long, another child (often a friend) makes it easy to be caught. In that way, all the children can enjoy the game.

Rough-and-Tumble Play

rough-and-tumble play Play that mimics aggression through wrestling, chasing, or hitting, but in which there is no intent to harm.

The most common form of active play is called **rough-and-tumble play** because it looks quite rough and because the children seem to tumble over one another. The term was coined by British scientists who studied primates in East Africa (Blurton-Jones, 1976). They noticed that monkeys often chased, attacked, rolled over in the dirt, and wrestled quite roughly, but without injuring one another.

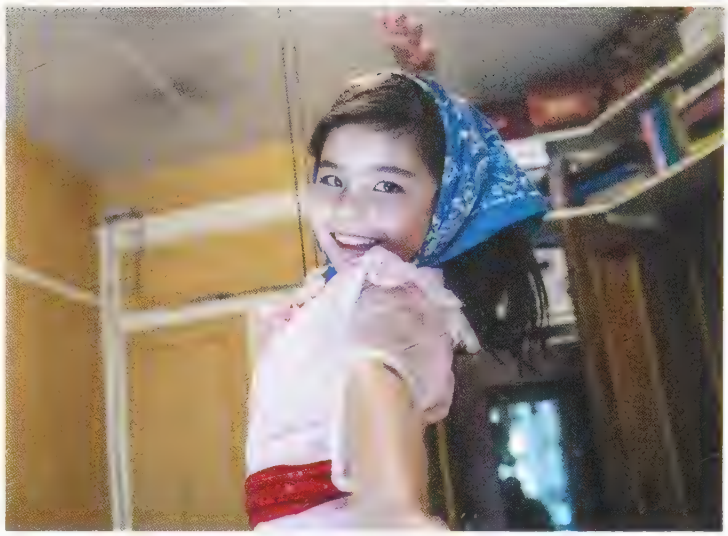
If a young male monkey wanted to play, he would simply catch the eye of a peer and then run a few feet away. This invitation to rough-and-tumble play was almost

always accepted with a *play face* (smiling, not angry). Puppies, kittens, and young baboons behave similarly.

When these scientists returned to London, they saw that their own children, like baby monkeys, engage in rough-and-tumble play, signified by the play face. Children chase, wrestle, and grab each other, developing games like tag and cops-and-robbers, with various conventions, expressions, and gestures that children use to signify "just pretend."

Rough-and-tumble play happens everywhere (although cops-and-robbers can be "robots-and-humans" or many other iterations) and has probably been common among children for thousands of years (Fry, 2014). It is much more common among boys than girls and flourishes best in ample space with minimal supervision (Pellegrini, 2013).

Many scientists think that rough-and-tumble play helps the prefrontal cortex develop, as children learn to regulate emotions, practice social skills, and strengthen their bodies (Pellis & Pellis, 2011). Indeed, some believe that play in childhood, especially rough-and-tumble play between father and son, may prevent antisocial behavior (even murder) later on (Fry, 2014; Wenner, 2009).



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Joy Supreme Pretend play in early childhood is thrilling and powerful. For this 7-year-old from the Park Slope neighborhood of Brooklyn, New York, pretend play overwhelms mundane realities, such as an odd scarf or awkward arm.

Drama and Pretending

Another major type of active play is **sociodramatic play,** in which children act out various roles and plots. Through such acting, children:

- Explore and rehearse social roles
- Learn to explain their ideas and persuade playmates
- Practice emotional regulation by pretending to be afraid, angry, brave, and so on
- Develop self-concept in a nonthreatening context

sociodramatic play Pretend play in which children act out various roles and themes in stories that they create.

Sociodramatic play builds on pretending, which emerges in toddlerhood. But preschoolers do more than pretend; they combine their imagination with that of their friends, advancing in theory of mind (Kavanaugh, 2011). The beginnings of sociodramatic play are illustrated by the following pair, a 3-year-old girl and a 2-year-old boy. The girl wanted to act out the role of a baby, and she persuaded a boy in her nursery school to be the parent.

Boy: Not good. You bad.
Girl: Why?
Boy: 'Cause you spill your milk.
Girl: No. 'Cause I bit somebody.
Boy: Yes, you did.
Girl: Say, "Go to sleep. Put your head down."
Boy: Put your head down.
Girl: No.
Boy: Yes.
Girl: No.
Boy: Yes. Okay, I will spank you. Bad boy. *[Spanks her, not hard]*
Girl: No. My head is up. *[Giggles]* I want my teddy bear.
Boy: No. Your teddy bear go away.
[At this point she asked if he was really going to take the teddy bear away.]

[from Garvey, reported in Cohen, 2006, p. 72]

Note the social interaction in this form of play, with the 3-year-old clearly more mature than the 2-year-old. She created, directed, and

Machine Guns Ready Good versus evil is a universal theme, but children need parents, community, or television to tell them who is evil and what must be done to them. During the civil war in Liberia, these boys practiced killing the enemy. That war ended. Hopefully these boys, now older, also developed more constructive play. Sadly, elsewhere—Syria? Ukraine? Palestine?—children take up the fight.



ANSWER TO OBSERVATION QUIZ (from page 319): Although controlling the trajectory of a ball with feet is a fine motor skill, these boys are using gross motor skills—their entire bodies (arms, torsos, even heads)—to run to the ball.

played her part, sometimes accepting what the boy said and sometimes not. The boy took direction, yet also made up his own dialogue and actions ("Bad boy"). It is noteworthy that the 2-year-old boy was willing to cooperate. When children are a few years older than these two, play is almost exclusively with peers of the same sex, if they are available (Leaper, 2013).

A slightly older girl might want to play with the boys, but the older boys usually do not allow her (Pellegrini, 2013). Boy-versus-girl play emerges later, at puberty, but toward the end of early childhood both sexes usually stick to their own unless a particular neighborhood group is quite small, and then the girls and boys play with each other.

Older preschoolers are not only more gender-conscious, their sociodramatic play is much more elaborate. This was evident in four boys, about age 5, in a day-care center in Finland. Joni plays the role of the evil one who menaces the other boys; Tuomas directs the drama and acts in it as well.

Tuomas: And now he [Joni] would take me and would hang me. . . . This would be the end of all of me.

Joni: Hands behind.

Tuomas: I can't help it. I have to. *[The two other boys follow his example.]*

Joni: I would put fire all around them.
[All three brave boys lie on the floor with hands tied behind their backs. Joni piles mattresses on them, and pretends to light a fire, which crackles closer and closer.]

Tuomas: Everything is lost.
[One boy starts to laugh.]

Petterl: Better not to laugh, soon we will all be dead. . . . I am saying my last words.

Tuomas: Now you can say your last wish. . . . And now I say I wish we can be terribly strong.
[At that point, the three boys suddenly gain extraordinary strength, pushing off the mattresses and extinguishing the fire. Good triumphs over evil, but not until the last moment, because, as one boy explains, "Otherwise this playing is not exciting at all."]

[adapted from Kalliala, 2006, p. 83]

Good versus evil is a favorite theme of boys' sociodramatic play, with danger part of the plot but victory in the end. By contrast, girls often act out domestic scenes, with themselves as the adults. In the same day-care center where Joni piled mattresses on his playmates, the girls say their play is "more beautiful and peaceful . . . [but] boys play all kinds of violent games" (Kalliala, 2006, p. 110).

The prevalence of sociodramatic play varies by culture, with parents often following cultural norms. Some cultures find make-believe frivolous and discourage it; In other cultures, parents teach toddlers to be lions, or robots, or ladies drinking tea. Then children elaborate on those themes (Kavanaugh, 2011). Many children are avid television watchers, and they act out superhero themes. Some parents never let their children watch videos of any kind, especially ones with violent themes.


ART DIRECTORS & TRIP/ALAMY

Stopped In Her Tracks The birthday balloon or the tiny horse on the floor are no match for the bright images on the screen, designed to capture every child's attention. Are you critical of the parents who bought, placed, and turned on that large television for their 2-year-old, or the culture that allows such programming? Would you report this as child neglect?

That children act out superheroes and villains from video screens

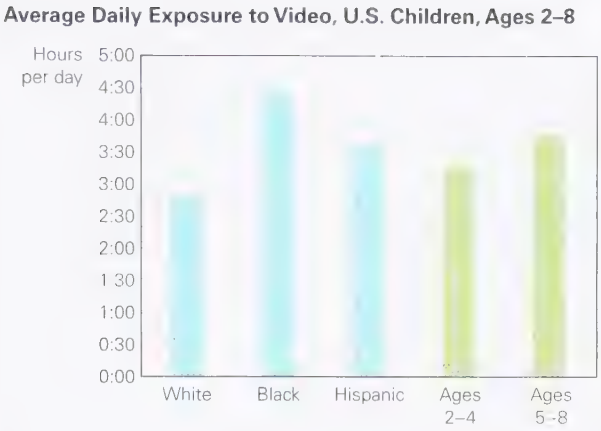


FIGURE 10.1

Learning by Playing Fifty years ago, the average child spent three hours a day in outdoor play. Video games and television have largely replaced that play time, especially in cities. Children seem safer if parents can keep an eye on them, but what are the long-term effects on brain and body?

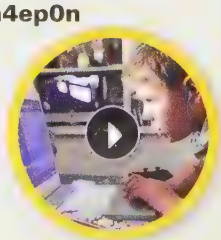
is troubling to many developmentalists. They prefer prefer that children's dramas come from their own imagination, not from the media. Of course, some children learn from videos, especially if adults watch with them and reinforce the lessons. However, children on their own rarely select educational programs over fast-paced cartoons, in which characters hit, shoot, and kick. And then they act out what they have seen.

Canadian as well as U.S. organizations of professionals in child welfare (e.g., pediatricians) suggest children under age 2 have no screen time, and those over age 2 have less than an hour a day. However about half of all North American children exceed those limits, with screen time increasing as income falls (Carson et al., 2013; Fletcher et al., 2014). Professionals are concerned for many reasons: (1) violent media teaches aggression; (2) gender and ethnic stereotypes are pervasive; and (3) passive watching reduces time for family interaction and active play (see Figure 10.1).

SUMMING UP As they have done in every era, all children everywhere play during early childhood, which makes many developmentalists think play is essential for healthy development. Some parents and other adults are not convinced; they would rather children help at home or learn academic skills.

Social play teaches social skills. In that way, at least, there is no doubt that children benefit from play with peers even more than from solitary play or play with adults. Specific games and dramas vary by culture and gender. Rough-and-tumble play is active play that boys particularly enjoy; sociodramatic play is common in children of both sexes. Boys tend to prefer good-versus-evil dramas, with themselves as heroes who defeat the bad guys; girls may prefer domestic scenes, with themselves as the adults. Imaginary play is considered healthy for preschoolers; "screen time" is discouraged by most experts in child development.

Video: The Impact of Media in Early Childhood
http://qrs.ly/on4ep0n



MONKEY BUSINESS IMAGES/SHUTTERSTOCK

WHAT HAVE YOU LEARNED?

1. What are children thought to gain from play?
2. Why might playing with peers help children build muscles and develop self-control?
3. What do children learn from rough-and-tumble play?
4. What do children learn from sociodramatic play?
5. Why do many experts want to limit children's screen time?

Challenges for Caregivers

We have seen that young children's emotions and actions are affected by many factors, including brain maturation, culture, and peers. Now we focus on another primary influence on young children: their caregivers. Parents are crucial, and alternate caregivers become pivotal as well.

authoritarian parenting An approach to child rearing that is characterized by high behavioral standards, strict punishment for misconduct, and little communication from child to parent.

permissive parenting An approach to child rearing that is characterized by high nurturance and communication but little discipline, guidance, or control. (Also called *indulgent parenting.*)

authoritative parenting An approach to child rearing in which the parents set limits but listen to the child and are flexible.

neglectful/uninvolved parenting An approach to child rearing in which the parents are indifferent toward their children and unaware of what is going on in their children's lives.

Caregiving Styles

Many researchers have studied the effects of parenting strategies and emotions. Of course, genes and cultures differ, and that shapes children. Beyond that, however, some parental practices lead to psychopathology while others encourage children to become outgoing, caring adults (Deater-Deckard, 2013).

Baumrind's Three Styles of Caregiving

Although thousands of researchers have traced the effects of parenting on child development, the work of one person, 50 years ago, continues to be influential. In her original research, Diana Baumrind (1967, 1971) studied 100 preschool children, all from California, almost all middle-class European Americans. (The cohort and cultural limitations of this sample were not obvious at the time.)

Baumrind found that parents differed on four important dimensions:

1. *Expressions of warmth.* Some parents are warm and affectionate; others, cold and critical.
2. *Strategies for discipline.* Parents vary in how they explain, criticize, persuade, and punish.
3. *Communication.* Some parents listen patiently; others demand silence.
4. *Expectations for maturity.* Parents vary in expectations for responsibility and self-control.

On the basis of these dimensions, Baumrind identified three parenting styles (summarized in Table 10.1).

Authoritarian parenting. The authoritarian parent's word is law, not to be questioned. Misconduct brings strict punishment, usually physical. Authoritarian parents set down clear rules and hold high standards. They do not expect children to offer opinions; discussion about emotions is especially rare. (One adult from such a family said that "How do you feel?" had only two possible answers: "Fine" and "Tired.") Authoritarian parents seem cold, rarely showing affection.

Permissive parenting. Permissive parents (also called *indulgent*) make few demands, hiding any impatience they feel. Discipline is lax, partly because they have low expectations for maturity. Permissive parents are nurturing and accepting, listening to whatever their offspring say, even if it is profanity or criticism of the parent.

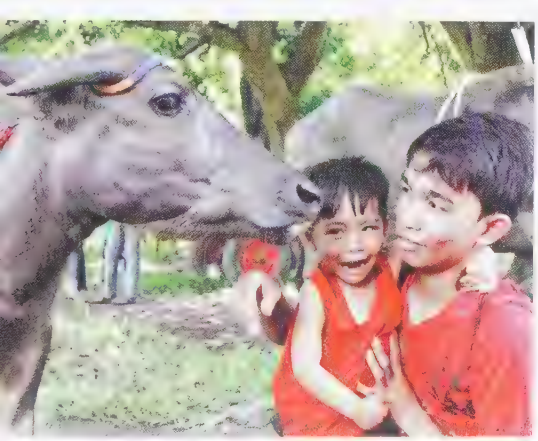
Authoritative parenting. Authoritative parents set limits, but they are flexible. They encourage maturity, but they usually listen and forgive (not punish) if the child falls short. They consider themselves guides, not authorities (unlike authoritarian parents) and not friends (unlike permissive parents).

Other researchers describe a fourth style, called **neglectful/uninvolved parenting,** which may be confused with permissive but is quite different. The similarity is that neither permissive nor neglectful parents use physical punishment. However, neglectful parents are oblivious to their children's behavior; they seem

Especially for Political Scientists Many observers contend that children learn their political attitudes at home, from the way their parents teach them. Is this true? (see response, page 326)

OBSERVATION QUIZ Is the father below authoritarian, authoritative, or permissive? (see answer, page 326)

Protect Me From the Water Buffalo These two are at the Carabao Kneeling Festival. In rural Philippines, hundreds of these large but docile animals kneel on the steps of the church, part of a day of gratitude for the harvest.



©ERIK DE CASTRO/REUTERS/CORBIS

TABLE 13.1 Characteristics of Parenting Styles Identified by Baumrind

Style	Warmth	Discipline	Expectations of Maturity	Communication: Parent to Child	Communication: Child to Parent
Authoritarian	Low	Strict, often physical	High	High	Low
Permissive	High	Rare	Low	Low	High
Authoritative	High	Moderate, with much discussion	Moderate	High	High

not to care. By contrast, permissive parents care very much: They defend their children, arrange play dates, and sacrifice to buy coveted toys.

The following long-term effects of parenting styles have been reported, not only in the United States but in many other nations as well (Baumrind, 2005; Baumrind et al., 2010; Chan & Koo, 2011; Huver et al., 2010; Rothrauff et al., 2009; Deater-Deckard, 2013).

- *Authoritarian* parents raise children who become conscientious, obedient, and quiet but not especially happy. Such children tend to feel guilty or depressed, internalizing their frustrations and blaming themselves when things don't go well. As adolescents, they sometimes rebel, leaving home before age 20.
- *Permissive* parents raise children who lack self-control, especially in the give-and-take of peer relationships. Inadequate emotional regulation makes them immature and impedes friendships, so they are unhappy. They tend to continue to live at home, still dependent on their parents, in early adulthood.
- *Authoritative* parents raise children who are successful, articulate, happy with themselves, and generous with others. These children are usually liked by teachers and peers, especially in cultures that value individual initiative (e.g., the United States).
- *Neglectful/uninvolved* parents raise children who are immature, sad, lonely, and at risk of injury and abuse, not only in early childhood but also lifelong.



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Pay Attention Children develop best with lots of love and attention. They shouldn't have to ask for it!

Problems with Baumrind's Styles

Baumrind's classification schema is often criticized. Problems include the following:

- Her participants were not diverse in SES, ethnicity, or culture.
- She focused more on adult attitudes than on adult actions.
- She overlooked children's temperamental differences.
- She did not recognize that some "authoritarian" parents are also affectionate.
- She did not realize that some "permissive" parents provide extensive verbal guidance.

We now know that a child's temperament powerfully affects caregivers. Caring for a child is an interactive process, and good caregivers treat each child as an individual who needs personalized care. That may make outsiders misinterpret the parental practices they see.

For example, fearful children require reassurance while impulsive ones need strong guidelines. Parents of such children may, to outsiders, seem permissive or authoritarian. Of course, some parents *are* too lax or too rigid, but every child needs some protection and guidance; Some more than others. Overprotection and hypervigilance are both a cause and consequence of childhood anxiety (McShane & Hastings, 2009; Deater-Deckard, 2013), but the right balance depends on the particular child, as differential susceptibility makes clear.

ANSWER TO OBSERVATION QUIZ (from page 324): It is impossible to be certain based on one moment, but the best guess is authoritative. He seems patient and protective, providing comfort and guidance, neither forcing (authoritarian) nor letting the child do whatever he wants (permissive).

Response for Political Scientists (from page 324): There are many parenting styles, and it is difficult to determine each one's impact on children's personalities. At this point, attempts to connect early child rearing with later political outlook are speculative.

Cultural Variations

The significance of context is obvious when children of various ethnic groups are compared because parents in various cultures have heartfelt, and sometimes opposite, child-rearing strategies. One explanation is genetic: Certain alleles may be more common in some ethnic groups, which may affect child temperament and thus make a certain style of parenting more effective. However, a much more plausible reason for cultural differences is that caregivers anticipate the social context in which the child must function.

U.S. parents of Chinese, Caribbean, or African heritage are often stricter than those of European backgrounds, yet their children seem to develop better than if their parents were easygoing (Parke & Buriel, 2006; Ng et al., 2014). Latino parents are sometimes thought to be too intrusive, other times too permissive—but their children seem to be happier than the children of European American parents who behave the same way (García & Garcia, 2009; Ispa et al., 2004).

Does culture erase the effects of each of the four styles of parenting? No. However, the outcome of any parenting style is affected by the child's temperament, the parent's personality, and the social context. This later factor may be particularly important for minority children growing up in a majority culture (Henry, 2011).

In a detailed study of 1,477 instances in which Mexican American mothers of 4-year-olds tried to get their children to do something they were not doing, most of the time the mothers simply uttered a command and the children complied (Livas-Dlott et al., 2010). This simple strategy, with the mother asserting authority and the children obeying without question, might be considered authoritarian.

Almost never, however, did the mothers use physical punishment or even harsh threats when the children did not immediately do as they were told—which happened 14 percent of the time. For example,

> Hailey [the 4-year-old] decided to look for another doll and started digging through her toys, throwing them behind her as she dug. Maricruz [the mother] told Hailey she should not throw her toys. Hailey continued to throw toys, and Maricruz said her name to remind her to stop. Hailey continued her misbehavior, and her mother repeated "Hailey" once more. When Hailey continued, Maricruz raised her voice but calmly directed, "Hailey, look at me." Hailey continued but then looked at Maricruz as she explained, "You don't throw toys; you could hurt someone." Finally, Hailey complied and stopped.
>
> *[Livas-Dlott et al., 2010, p. 572]*

Note that the mother's first three efforts failed, and then a look accompanied by an explanation (albeit inaccurate in that setting, as no one could be hurt) succeeded. The researchers explain that these Mexican American families did not fit any of Baumrind's categories; respect for adult authority did not mean a cold mother–child relationship. Instead, the relationship shows evident *carino* (caring) (Livas-Dlott et al., 2010).

Warmth and caring may be the crucial aspect of parenting style in every ethnic group. Other research also finds that parental affection and warmth allow children to develop self-respect and to become compassionate adults, and this can occur in any of the three common parenting styles within any culture (Deater-Deckard, 2013; Eisenberg et al., 2013).

Given a multicultural and multicontextual perspective, developmentalists hesitate to be too specific in recommending any particular parenting style. That does not mean that all families function equally well—far from it. Signs of emotional distress, including a child's anxiety, aggression, and inability to play with others, indicate that the family may not be the safe haven of support and guidance that it should be. Ineffective, abusive, and neglectful parents are one cause of child

distress, but not the only one. It is a mistake to assume that the parents are to blame whenever the child is troubled.

Becoming Boys or Girls: Sex and Gender

Biology determines whether a baby is male or female except in very rare cases when genes do not function normally. As you remember from Chapter 4, at about 8 weeks after conception, the SRY gene directs growth of external reproductive organs, and then male hormones exert subtle control over the brain, body, and later behavior. Without that gene, the fetus develops female organs, which produce female hormones that also affect the brain and behavior.

Sometimes the sex hormones are inactive prenatally and the child does not develop like the typical boy or girl (Hines, 2013). That is rare; most children are male or female in all three ways: chromosomes, genitals, and hormones. That is their nature, but obviously nurture affects sexual development lifelong.

During early childhood, patterns of behavior and preferences related to gender become important to children and apparent to adults. Before age 2, children apply gender labels (*Mrs., Mr., lady, man*) consistently. By age 4, children are convinced that certain toys (such as dolls or trucks) and roles (not just Daddy or Mommy, but also nurse, teacher, police officer, soldier) are "best suited" for one sex or the other.

Sexual stereotypes often become obvious and rigid between ages 3 and 6. Dynamic-systems theory suggests that concepts of male and female behavior are affected by many developmental aspects of biology and culture, changing as humans grow older (Martin & Ruble, 2010).

Many scientists distinguish **sex differences,** which are biological differences between males and females, from **gender differences,** which are culturally prescribed roles and behaviors. In theory, this distinction seems straightforward, but, as with every nature–nurture distinction, the interaction between sex and gender makes it hard to separate the two. Scientists need to "treat culture and biology not as separate influences but as interacting components of nature and nurture" (Eagly & Wood, 2013, p. 349).

Young children are often confused about the origin of male-female differences. One little girl said she would grow a penis when she got older, and one little boy offered to buy his mother one. Ignorance about biology was demonstrated by a 3-year-old who went with his father to see a neighbor's newborn kittens. Returning home, the child told his mother that there were three girl kittens and two boy kittens. "How do you know?" she asked. "Daddy picked them up and read what was written on their tummies," he replied.

Many preschool children do not realize that their own biological sex is permanent. In one preschool, the children themselves decided that one wash-up basin was for boys and the other for girls, a decision that reflects young children's insistence on gender distinctions. One girl started to use the boys' basin.

Boy: This is for the boys.
Girl: Stop it. I'm not a girl and a boy, so I'm here.
Boy: What?
Girl: I'm a boy and also a girl.
Boy: You, now, are you today a boy?
Girl: Yes.
Boy: And tomorrow what will you be?
Girl: A girl. Tomorrow I'll be a girl. Today I'll be a boy.
Boy: And after tomorrow?
Girl: I'll be a girl.

[Ehrlich & Blum-Kulka, 2014, p.31]

sex differences Biological differences between males and females, in organs, hormones, and body type.

gender differences Differences in the roles and behaviors of males and females that are prescribed by the culture.

Same Situation, Far Apart: Culture Clash? He wears the orange robes of a Buddhist monk and she wears the hijab of a Muslim girl. Although he is at a week-long spiritual retreat led by the Dalai Lama and she is in an alley in Pakistan, both carry universal toys—a pop gun and a bride doll, identical to those found almost everywhere.



DIPTENDU DUTTA/AFP/GETTY IMAGES



SILVAS OEAN/THE IMAGE WORKS





Test Your Imagination Preschool children have impressive imaginations and strong social impulses. When two friends are together, they launch into amazing fun, drinking tea, crossing swords, wearing special masks or bracelets, or whatever. Adults may be more limited—can you picture these two scenes with genders switched, the boys in the tea party and the girls in the sword fight?

phallic stage Freud's third stage of development, when the penis becomes the focus of concern and pleasure.

Oedipus complex The unconscious desire of young boys to replace their father and win their mother's romantic love.

superego In psychoanalytic theory, the judgmental part of the personality that internalizes the moral standards of the parents.

Electra complex The unconscious desire of girls to replace their mother and win their father's romantic love.

identification An attempt to defend one's self-concept by taking on the behaviors and attitudes of someone else.

As already mentioned, girls tend to play with other girls and boys with other boys. Despite their parents' and teachers' wishes, children say, "No girls [or boys] allowed." Most older children consider ethnic discrimination immoral, but they accept some sex discrimination (Møller & Tenenbaum, 2011). Why?

Theories of Gender Development

A dynamic-systems approach reminds us that attitudes, roles, and even the biology of gender differences change from one developmental period to the next. Theories about how and why this occurs suggest explanations (Martin & Ruble, 2010; Leaper, 2013). Consider the five broad theories first described in Chapter 2.

Psychoanalytic Theory

Freud (1938/1995) called the period from about ages 3 to 6 the **phallic stage,** named after the *phallus,* the Greek word for penis. At about 3 or 4 years of age, said Freud, boys become aware of their male sexual organ. They masturbate, fear castration, and develop sexual feelings toward their mother.

These feelings make every young boy jealous of his father—so jealous, according to Freud, that he wants to replace his dad. Freud called this the **Oedipus complex,** after Oedipus, son of a king in Greek mythology. Abandoned as an infant and raised in a distant kingdom, Oedipus returned to his birthplace and, without realizing it, killed his father and married his mother. When he discovered the horror, he blinded himself.

Freud believed that this ancient story dramatizes the overwhelming emotions that all boys feel about their parents—both love and hate. Every male feels guilty about his unconscious incestuous and murderous impulses. In self-defense, he develops a powerful conscience called the **superego,** which is quick to judge and punish.

That marks the beginning of morality, according to psychoanalytic theory. This theory contends that a boy's fascination with superheroes, guns, kung fu, and the like arises from his unconscious impulse to kill his father. Further, an adult man's homosexuality, homophobia, or obsession with guns, prostitutes, and hell arise from problems at the phallic stage.

Freud offered several descriptions of the moral development of girls. One centers on the **Electra complex** (also named after a figure in classical mythology). The Electra complex is similar to the Oedipus complex in that the little girl wants to eliminate the same-sex parent (her mother) and become intimate with the other-sex parent (her father). That may also lead girls to develop a superego.

According to psychoanalytic theory, at the phallic stage, children cope with guilt and fear through **identification;** that is, they try to become like the same-sex parent. Consequently, young boys copy their fathers' mannerisms, opinions, and actions, and girls copy their mothers'. Both sexes exaggerate the male or female role, which is why 5-year-olds have such sexist ideas.

Most psychologists have rejected Freud's theory regarding sex and gender. They favor one or another of many other theories to explain the young child's sex and gender awareness.

a case to study

My Daughters

Since the superego arises from the phallic stage, and since Freud believed that sexual identity and expression are crucial for mental health, his theory suggests that parents should encourage children to accept and follow gender roles. Many social scientists disagree. They contend that the psychoanalytic explanation of sexual and moral development "flies in the face of sociological and historical evidence" (David et al., 2004, p. 139).

Accordingly, I learned in graduate school that Freud was unscientific, and I deliberately dressed my baby girls in blue, not pink. However, as explained in Chapter 2, developmental scientists seek to connect research, theory, and experience. My own experience has made me rethink my rejection of Freud, as episodes with my four daughters illustrate.

My rethinking began with a conversation with my eldest daughter, Bethany, when she was about 4 years old:

Bethany: When I grow up, I'm going to marry Daddy.
Me: But Daddy's married to me.
Bethany: That's all right. When I grow up, you'll probably be dead.
Me: *[Determined to stick up for myself]* Daddy's older than me, so when I'm dead, he'll probably be dead, too.
Bethany: That's OK. I'll marry him when he gets born again.

I was dumbfounded, without a good reply. I had no idea where she had gotten the concept of reincarnation. Bethany saw my face fall, and she took pity on me:

Bethany: Don't worry, Mommy. After you get born again, you can be our baby.

The second episode was a conversation I had with my daughter Rachel when she was about 5:

Rachel: When I get married, I'm going to marry Daddy.
Me: Daddy's already married to me.
Rachel: *[With the joy of having discovered a wonderful solution]* Then we can have a double wedding!

The third episode was considerably more graphic. It took the form of a "valentine" left on my husband's pillow on February 14th by my daughter Elissa (see Figure 10.2).

Finally, when Sarah turned 5, she also said she would marry her father. I told her she couldn't, because he was married to me. Her response revealed one more hazard of watching TV: "Oh, yes, a man can have two wives. I saw it on television."

As you remember from Chapter 1, a single example (or four daughters from one family) does not prove that Freud was correct. I still think Freud was wrong on many counts. But his description of the phallic stage seems less bizarre than I once thought.



COURTESY KATHLEEN BERGER

FIGURE 10.2
Pillow Talk Elissa placed this artwork on my husband's pillow. My pillow, beside it, had a less colorful, less elaborate note—an afterthought. It read, "Dear Mom, I love you too."

Behaviorism

Behaviorists believe that virtually all roles, values, and morals are learned. To behaviorists, gender distinctions are the product of ongoing reinforcement and punishment, as well as social learning. Parents, peers, and teachers all reward behavior that is "gender appropriate" more than behavior that is "gender inappropriate" (Berenbaum et al., 2008).

For example, "adults compliment a girl when she wears a dress but not when she wears pants" (Ruble et al., 2006, p. 897), and a boy who asks for both a train and a doll for his birthday is likely to get the train. Boys are rewarded for boyish requests, not for girlish ones. Indeed, the parental push toward traditional gender

behavior in play and chores is among the most robust findings of decades of research on this topic (Eagly & Wood, 2013).

Social learning is considered an extension of behaviorism. According to that theory, people model themselves after people they perceive to be nurturing, powerful, and yet similar to themselves. For young children, those people are usually their parents.

As it happens, adults are the most sex-typed of their entire lives when they are raising young children. If an employed woman ever leaves her job to become a housewife, it is when she has a baby. Fathers behave differently than mothers with young children, who learn sex roles from their parents. No wonder they are quite sexist (Hallers-Haalboom et al., 2014).

Furthermore, although national policies (e.g., subsidizing preschool) impact gender roles and many fathers are involved caregivers, women in every nation do much more child care, house cleaning, and meal preparation than do men (Hook, 2010). Children follow those examples, unaware that the behavior they see is caused partly by their very existence: Before children are born, many couples share domestic work, but baby care often changes that.

Cognitive Theory

Cognitive theory offers an alternative explanation for the strong gender identity that becomes apparent at about age 5 (Kohlberg et al., 1983). Remember that cognitive theorists focus on how children understand various ideas. A **gender schema** is the child's understanding of male–female differences (Martin et al., 2011).

gender schema A cognitive concept or general belief based on one's experiences—in this case, a child's understanding of sex differences.

Cognitive theorists point out that young children have many gender-related experiences but not much cognitive depth. They see the world in simple, egocentric terms, as explained in Chapter 9. For this reason, their gender schemas categorize male and female as opposites. Nuances, complexities, exceptions, and gradations about gender (as well as just about everything else) are beyond them.

As Piaget noted, during the preoperational stage, appearance trumps logic. One group of researchers who advocate the cognitive interpretation noted that "[m]any young children pass through a stage of gender appearance rigidity; girls insist on wearing dresses, often pink and frilly, whereas boys refuse to wear anything with a hint of femininity" (Halim et al., 2014, p. 1091). In the research reported by this group, parents sometimes were quite unisex, in attitude or action, but that did not necessarily sway a preschool girl who wanted a bright pink tutu and a sparkly tiara. The child's gender schema overcame the child's experience.

Sociocultural Theory

Sociocultural theory stresses the importance of cultural values and customs. Some aspects of a culture are transmitted through the parents, as explained in the discussion of behaviorism, but many more arise from the larger community. This varies from place to place and time to time, as would be expected for any cultural value.

Consider a meta-analysis of international research. In many cultures, men prefer younger, more attractive women as mates, and women seek older, more established men. But this preference changes as cultures change, when nations become more equitable in treatment of men and women (Zentner & Mitura, 2012).

Thus, national culture affects even personal adult choices such as marriage partners. Children are influenced by norms. That is why boys want to be soldiers, or engineers, or football players—ambitions more apparent in some cultures than others.

My 4-year-old daughter said she wanted to be a nurse when she grew up. I replied, "Nurses are wonderful, but why don't you become a doctor?" She looked at

me as if I were stupid: "Oh Mommy, the girls are nurses and the boys are doctors." She was right: I knew possibilities, but I forgot her personal experience.

Universal Theories

Humanism stresses the hierarchy of needs, beginning with survival, then safety, then love and belonging. The final two needs—respect and self-actualization—are not considered priorities for people until the earlier three have been satisfied.

Ideally, babies have all their basic needs met, and toddlers learn to feel safe, which makes love and belonging crucial during early childhood. Children increasingly strive for admiration from their peers. Therefore, the girls seek to be one of the girls and the boys to be one of the boys.

In a study of slightly older children, participants wanted to be part of same-sex groups, not because they disliked the other sex, but because that satisfied their need to belong (Zosuls et al., 2011). As we have already seen, children increasingly prefer to play with children of their own sex because humans are social beings who want to be validated for who they are. By age 6, they are astute "gender detectives" who scan their environment for differences between boys and girls, not always accurately, as in this example:

> On her first day of school, Mia sits at the lunch table eating a peanut butter and jelly sandwich. She notices that a few boys are eating peanut butter and jelly, but not one girl is. When her father picks her up from school, Mia runs up to him and exclaims, "Peanut butter and jelly is for boys! I want a turkey sandwich tomorrow."
>
> *[Quoted in Miller et al., 2013, p. 307]*

Humanism would interpret this as evidence that Mia's need to belong to the girls in her class overruled her earlier basic need, which was satisfied with peanut butter and jelly.

Evolutionary theory holds that male–female sexual passion is one of humankind's basic drives, because all creatures have two essential urges—to survive and to reproduce. For this reason, males and females try to look attractive to the other sex—walking, talking, and laughing in gendered ways. If girls see their mothers wearing make-up and high heels, they want to do likewise.

According to evolutionary theory, the species' need to reproduce is part of everyone's genetic heritage, which makes young boys and girls copy adult behavior that is sexually alluring. For example, one 6-year-old girl, when she was taking a bath and her father came into the bathroom, put her hands on her chest to cover her nipples. Children begin to model themselves after adult men and women, so that they will be ready after puberty to mate and a new generation will be born, as evolution requires.

Thus, according to this theory, over millennia of human history, genes, chromosomes, and hormones have evolved to allow the species to survive. Genes dictate that boys are more active (rough-and-tumble play) and girls more domestic (playing house) because that prepares them for adulthood, when fathers defend against predators and mothers care for the home and children: To deny that is to deny nature.

What Is Best?

Each of the major developmental theories strives to explain the ideas that young children express and the roles they follow. No consensus has been reached. Regarding sex or gender, those who contend that nature is more important than nurture, or that nurture is more important than nature, tend to design, cite, and believe studies that endorse their perspective. Only recently has a true interactionist

LaunchPad

Video Activity: The Boy Who Was a Girl presents the case of David/Brenda Reimer as an exploration of what it means to be a boy or a girl.

perspective (that is a perspective that emphasizes that nature affects nurture and vice versa) on gender been endorsed (Eagly & Wood, 2013).

These theories raise important questions: What roles *should* parents and other caregivers teach? Should every child learn to combine the best of both sexes (called *androgyny*), thereby causing gender stereotypes to crumble as children become more mature, much as a belief in Santa and the Tooth Fairy disappears? Or should male–female distinctions be encouraged as essential for human reproduction and family life?

Answers vary among developmentalists as well as among parents and cultures. Generally, children become more stereotyped in the gender behaviors they endorse, a tendency some adults encourage and others do not. A few children rebel. They are called transgender, or gender dysphoric, or non-conforming, with each label controversial because of the implications for the child and the family (Drescher, 2014). During most of childhood, such children often hide their feelings to prevent being rejected by peers. This is particularly true during the preschool years, when peers and parents usually expect every child to follow gender norms (Cotton, 2014).

Determining how to raise children who are happy to be themselves but not prejudiced against those of the other sex or against those who are gender non-conforming is one challenge that all caregivers face.

SUMMING UP Caregiving styles vary, ranging from very strict, cold, and demanding to very lax, warm, and permissive. Baumrind's classic research categorized parenting as authoritarian, authoritative, and permissive; these categories still seem relevant, even though the original research was limited in many ways. A fourth type, neglectful/uninvolved, has also been described. Cross-cultural research questions Baumrind's categories but finds, in general, that a middle ground—neither strict nor lax—seems best. Parental warmth seems more crucial than other aspects of style. Neglectful and uninvolved parenting is, in every culture, harmful.

The young child's ideas and stereotypes about males and females are quite rigid during early childhood. Norms are changing. Theorists differ in their explanations and interpretations of gender differences, some emphasizing biological and brain differences, others stressing the impact of culture. That is true for caregivers as well: All are affected by their culture and assumptions, but some believe that the primary impetus for boy–girl behavior is biological, others that culture is far more influential.

WHAT HAVE YOU LEARNED?

1. Which parenting style seems to promote the happiest, most successful children?
2. Why do U.S. childhood professionals advise limitations on electronic media for young children?
3. What did Freud believe about the attitudes young children have regarding their mothers and fathers?
4. What do behaviorists say about the origins of gender roles?
5. How is the idea of the sexes as opposites related to cognitive theory?
6. How does evolutionary theory explain why children follow gender norms?
7. Why is the nature–nurture debate likely to arise when gender roles are considered?

Moral Development

Children develop increasingly complex moral values, judgments, and behaviors as they mature. Emotional regulation, sexual differences, and parenting practices are all moral issues, as "morality is multifaceted and includes affective, cognitive, and behavioral components" (Smetana, 2013). Thus, moral development is evident in every topic already discussed.

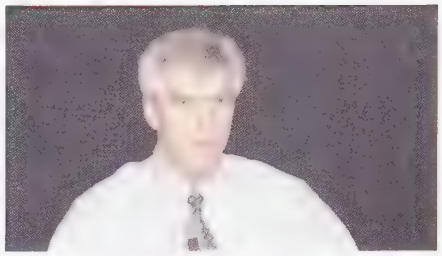
Rough-and-tumble play, for instance, teaches children not to hurt their playmates. Concern for helping other people is also apparent in sociodramatic play, especially the rescue fantasies and caregiving routines that are commonly acted out. Children learn to take turns and to share, and they believe it unfair when another child does not do so (Utendale & Hastings, 2011).

Piaget thought that moral development began when children learned games with rules, which he connected with concrete operational thought at about age 7 (Piaget, 1932/2013). We now know that Piaget was mistaken: Both games with rules and moral development are evident much earlier.

Some precursors of morality appear in infancy (Narvaez & Lapsley, 2009). By age 3 or even earlier, children evidence many moral emotions and behaviors. For example, when given rewards to distribute, 3-year-olds try to be fair, giving each person an equal amount unless someone has been helpful or mean, and then they are rewarded by getting more or punished by getting less (Baumard et al., 2012).

With maturation and adult guidance over the preschool years, children develop guilt (as Erikson explained) and self-control. That helps them behave in ethical ways and feel pride when they do so (Kochanska et al., 2009; Konner, 2010; R. Thompson, 2014).

LaunchPad



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Video: Interview with Lawrence Walker discusses what parents can do to encourage their children's moral development.

Nature and Nurture

Many parents, teachers, and other adults consider children's "good" behavior more important than any other advancement already described, including health, motor skills, intelligence, language, and social play. Perhaps for this reason, debate rages over how children internalize standards, develop virtues, and avoid vices. Scholars in many social sciences hold conflicting perspectives—nature versus nurture again.

The *nature* perspective suggests that morality is genetic, an outgrowth of natural bonding, attachment, and cognitive maturation. That would explain why young children help and defend their parents, no matter what the parents do, and punish other children who violate moral rules. Even infants have a sense of what is fair and not, expecting adults to reward effort. An experiment with 6-month-old babies found that they preferred a puppet who helped another puppet, rather than one who did not (Hamlin, 2014).

Morality, if defined as behavior that helps others without immediate reward to oneself, may be in human DNA. According to evolutionary theory, humans protect, cooperate, and even sacrifice for one another because each individual is defenseless and vulnerable to weather, strangers, and wild animals. To survive, people need to rely on other people, and from that need springs a moral sense (Dunning, 2011). The body produces hormones, specifically oxytocin, that naturally push people toward trusting and loving each other (Zak, 2012).

The *nurture* perspective contends that culture is crucial to moral development. That would explain why young children emulate people who follow the rules of their community, even if the actual behavior is not innately good or bad. Although children understand the intellectual difference between morality and custom, some children believe that people who eat raw fish, or hamburgers, or bacon, or dogs are immoral (Turiel, 2002).

Developmentalists distinguish between ethical behavior (seeking not to harm others) and conventional behavior (seeking to follow norms), but that distinction is not always apparent, and may itself be cultural (Haidt, 2013). Consider gun use, abortion, the death penalty, disobeying an elder, stealing food—all considered immoral in some cultures, conventional in others, and morally right (not wrong) in some communities under particular circumstances.

Both nature and nurture are influential in standards of conduct, and the interaction between the two is essential—and well worth discussion and debate. Beyond that truism, specifics cannot be settled here.

However, it is apparent that morality appears during early childhood and that parental practices are crucial as they teach children—explicitly and by example—how to behave (R. Thompson, 2014). Accordingly, we explore two moral issues that arise from age 2 to age 6: children's aggression and adults' disciplinary practices. Nature and nurture are crucial in both.

Empathy and Antipathy

Moral emotions are evident as children play with one another. With increasing social experiences and decreasing egocentrism, children develop **empathy,** an understanding of other people's feelings and concerns, and **antipathy,** a feeling of dislike or even hatred. Experience is crucial at every age; people with more friends of various backgrounds are more empathetic to those of another race or immigration status.

empathy The ability to understand the emotions and concerns of another person, especially when those emotions and concerns differ from one's own.

antipathy Feelings of dislike or even hatred for another person.

Prosocial Behavior

Scientists studying young humans and other primates report spontaneous efforts to help others who are hurt, crying, or in need of help: Those efforts are evidence of empathy and compassion, which then lead to **prosocial behavior**—extending helpfulness and kindness without any obvious benefit to oneself.

prosocial behavior Actions that are helpful and kind but are of no obvious benefit to oneself.

Expressing concern, offering to share, and including a shy child in a game or conversation are examples of prosocial behavior among young children. Jack, age 3, showed empathy when he "refused to bring snacks with peanuts to school because another boy had to sit alone during snack because he was allergic to nuts. Jack wanted to sit with him" (Lovecky, 2009, p. 161).

Prosocial behavior seems to result more from emotion than from intellect, more from empathy than from theory of mind (Eggum et al., 2011). The origins of prosocial behavior may arise from parents helping their children become aware of their own emotions, not from telling children what emotions others might have (Brownell et al., 2013).

The link between empathy and later prosocial behavior in early childhood was traced longitudinally in children from 18 months to 6 years of age. A preschooler's empathy at ages 2 to 4 predicted prosocial behavior in first grade: Those empathetic preschoolers were more likely to share help, and include other children. Neither parents' education nor income predicted prosocial behavior (Taylor et al., 2013).

Prosocial reactions are not automatic. Some children limit empathy by "avoiding contact with the person in need [which illustrates] . . . the importance of emotion development and regulation in the development of prosocial behavior" and the critical influence of cultural norms (Trommsdorff & Cole, 2011, p. 136). Feeling distress may be a part of nature; whether a child expresses that emotion, and how a child responds to his or her feelings of distress, may be nurture.

Antisocial Actions

Antipathy can lead to **antisocial behavior**—deliberately hurting another person, including people who have done nothing wrong. Antisocial actions include verbal insults, social exclusion, and physical assaults (Calkins & Keane, 2009). An antisocial 4-year-old might look another child in the eye, scowl, and then kick him hard without provocation. In general, children become more prosocial and less antisocial as they mature (Ramani et al., 2010).

antisocial behavior Actions that are deliberately hurtful or destructive to another person.


MATTHIAS STOLT/GETTY IMAGES


LIZ BANFIELD/GETTY IMAGES

Pinch, Poke, or Pat Antisocial and prosocial responses are actually a sign of maturation: Babies do not recognize the impact of their actions. These children have much more to learn, but they already are quite social.

In some ways, antisocial behavior comes naturally (Seguin & Tremblay, 2013). For 2-year-olds, it is hard to let another child use a crayon that they have already used. Preschool children have a definite sense of ownership: If a crayon belongs to the teacher, it should be shared, but a child who owns it is allowed to be selfish (Neary & Friedman, 2014). The rules of ownership are understood by children as young as 3, who apply them more rigidly than adults from the same community.

At every age, antisocial behavior may indicate a failure of empathy. That may be brain-based; sometimes something is missing in the neuroanatomy of the person (Portnoy et al., 2013). But it also may result directly from parents who do not talk about emotions or respond to the emotions of the child (Taylor et al., 2013; Richards et al., 2014).

Aggression

Not surprisingly, given the moral sensibilities of young children, 5-year-olds already judge whether another child's aggression is justified or not. Children are particularly focused on effects, not motives: A child who accidentally spilled water on another's painting may be the target of that child's justified anger.

As with adults, impulsive self-defense is more readily forgiven than is a deliberate, unprovoked attack. As young children gain in social understanding, particularly theory of mind, they gradually become better at understanding someone else's intentions, and that makes them less likely to judge an accidental action as a hostile one (Choe et al., 2013a).

Researchers recognize four general types of aggression, all of which are evident in early childhood (see Table 10.2). **Instrumental aggression** is common among 2-year-olds, who often want something they do not have and simply try to take it. An aggressive reaction from the other child—crying, hitting, and resisting the grab of the instrumentally aggressive child—is also more typical at age 2 than earlier or later.

Reactive aggression is therefore common among young children; almost every child reacts when hurt, whether or not the hurt was deliberate. Children are less likely to respond with physical aggression as they develop emotional control and theory of mind (Olson et al., 2011).

instrumental aggression Behavior that hurts someone else because the aggressor wants to get or keep a possession or a privilege.

reactive aggression An impulsive verbal or physical retaliation for another person's intentional or accidental action

relational aggression Nonphysical acts, such as insults or social rejection, aimed at harming the social connection between the victim and other people.

bullying aggression Unprovoked, repeated physical or verbal attacks, especially on victims who are unlikely to defend themselves.

Relational aggression (usually verbal) destroys another child's self-esteem and disrupts the victim's social networks, becoming more hurtful as children mature. A young child might tell another, "You can't be my friend" or "You are fat," hurting another's feelings. These are examples of relational aggression.

The fourth and most ominous type is **bullying aggression,** done to dominate someone else. It is not rare among young children but should be stopped before school age, when it becomes particularly destructive. Not only does it destroy the self-esteem of victims, it impairs the later development of the bullies, who learn behavior patterns that will harm them in adulthood. (**Developmental Link:** An in-depth discussion of bullying appears in Chapter 13.)

TABLE 10.2 The Four Forms of Aggression

Type of Aggression	Definition	Comments
Instrumental aggression	Hurtful behavior that is aimed at gaining something (such as a toy, a place in line, or a turn on the swing) that someone else has	Often increases from age 2 to 6; involves objects more than people; quite normal; more egocentric than antisocial.
Reactive aggression	An impulsive retaliation for a hurt (intentional or accidental) that can be verbal or physical	Indicates a lack of emotional regulation, characteristic of 2-year-olds. A 5-year-old can usually stop and think before reacting.
Relational aggression	Nonphysical acts, such as insults or social rejection, aimed at harming the social connections between the victim and others	Involves a personal attack and thus is directly antisocial; can be very hurtful; more common as children become socially aware.
Bullying aggression	Unprovoked, repeated physical or verbal attack, especially on victims who are unlikely to defend themselves	In both bullies and victims, a sign of poor emotional regulation; adults should intervene before the school years. (Bullying is discussed in Chapter 13.)

All forms of aggression become less common from ages 2 to 6, as the brain matures and empathy increases. In addition, children learn to use aggression selectively, and that decreases both victimization and aggression later on (Ostrov et al., 2014). Parents, peers, and preschool teachers are pivotal mentors in this process.

It is a mistake to expect children to regulate their emotions on their own. If they are not guided, they may develop destructive patterns. It is also a mistake to punish aggressors too harshly because that may remove them from their zone of proximal development, where they can learn to regulate their anger.

In other words, although there is evidence that preschool children spontaneously judge others who harm people, with the emphasis on the actual hurt more than the intention, there also is evidence that prosocial and antisocial behavior is learned (Smetana, 2013). Preschool teachers are often instrumental in this education because they have many opportunities to teach: Aggression often arises in a social setting with other children.

A longitudinal study found that close teacher–student relationships in preschool predicted less aggression and less victimization in elementary school, presumably because close relationships led teachers to guide the children to control their own reactive aggression (Runions & Shaw, 2013).

Good Behavior

For people everywhere, part of human development is learning the moral standards of their culture. Each culture has particular moral principles; parents form

personal standards based on these principle and then guide their children in developing good behavior.

However, no child always does exactly what parents want. Indeed, if a child is too quiet and proper, that may be a sign that the child is fearful of a parent's rage. Some disagreements, some protests, some untoward impulses and unexpected rebellion are part of the normal process of growing up.

Lest anyone imagine that children will always be good if they have benevolent parents, consider a study of mothers and 3-year-olds during late afternoon (a stressful time). Conflicts (including verbal disagreements) arose about every two minutes (Laible et al., 2008). Here is one example that began with an activity recommended for every parent; the mother was about to take her daughter for a walk:

Child: I want my other shoes.
Mother: You don't need your other shoes. You wear your Pooh sandals when we go for a walk.
Child: Noooooo.
Mother: *[Child's name]*! You don't need your other shoes.
Child: *[Cries loudly]*
Mother: No, you don't need your other shoes. You wear your Pooh sandals when we go for a walk.
Child: Ahhhh. Want pretty dress. *[Crying]*
Mother: Your pretty dress!
Child: Yeah.
Mother: You can wear them some other day.
Child: Noooooo. *[Crying]*

[from Laible et al., 2008, pp. 442–443]

In this study, those 3-year-olds who had been securely attached at age 1 (an indication of responsive parenting) had as many conflicts as those who had been insecurely attached. Obviously, responsive parents do not always have children who are peaceful and obedient.

However, unlike the situation in the snippet above, the mothers of securely attached children more often compromised and explained (Laible et al., 2008). Is that the best response? Should this mother have offered reasons why the other shoes were not appropriate, or should she have let her daughter wear them? Alternatively, should she have slapped the child for crying, or said, "I won't walk with you if you fuss"?

Especially for Parents of 3-Year-Olds How could a parent compromise with a child who wants to wear "other shoes"? (see response, page 339)

Discipline

Since misbehavior is part of growing up, parents must respond. How to respond is a major moral issue for the parents, with each type of response teaching the child something about moral behavior.

Physical Punishment

In the United States, young children are slapped, spanked, or beaten more often than are infants or older children. They are physically disciplined more often than children in Canada or Western Europe but less often than children in Africa or South America. Not only in the United States but also in many developing nations, adults remember being physically punished and think it works. In some ways, they are correct: Physical punishment (called **corporal punishment** because it hurts the body) succeeds at the moment—it is impossible to misbehave while being spanked, and afterwards children are usually quiet.

corporal punishment Punishment that physically hurts the body, such as slapping, spanking, etc.

Longitudinal research finds, however, that children who are physically punished are more likely to become bullies, delinquents, and then abusive adults.

Especially for Parents Suppose you agree that spanking is destructive, but you sometimes get so angry at your child's behavior that you hit him or her. Is your reaction appropriate? (see response, page 340)

They are also less likely to learn quickly in school or attend college (Straus & Paschall, 2009). In fact, although children who misbehave in externalizing ways (hitting, yelling, throwing things) are more likely to be spanked, longitudinal research finds that children who are not spanked are more likely to learn self-control. As spanking increases, so does misbehavior (Gershoff, 2013).

In 33 nations (mostly in Europe), corporal punishment is illegal; in many nations on other continents, it is the norm. In the United States, parents use it often. Even in U.S. schools, paddling is legal (but rarely used) in 19 of the 50 states. Most of those states are in the Southeast, and most of the children who are paddled are African American boys, which raises questions about the justice of the punishment (Morones, 2013).

Although some adults believe that physical punishment will "teach a lesson" of obedience, the lesson that children learn may be that "might makes right." When they become bigger and stronger, children who have been physically disciplined then tend to use corporal punishment on others—their classmates, their wives or husbands, their children. Most developmentalists advise against corporal punishment, but this issue is controversial. Many parents believe that spanking is sometimes necessary.



JEREMY HORNER/CORBIS

Smack Will the doll learn never to disobey her mother again?

opposing perspectives

Is Spanking Okay?

Opinions about spanking are influenced by past experiences and cultural norms, making it hard for opposing perspectives to be understood by people on the other side (Ferguson, 2013).

What might be right with spanking? One argument is that over the centuries many parents have done it, so it has stood the test of time. Indeed, spanking is probably the most common punishment in the United States: One study found that 85% of United States teenagers remember being slapped or spanked by their mothers (Bender et al., 2007).

Another argument is that the correlations often reported between spanking and later depression, crime, low achievement, and so on may reflect SES differences, not spanking. As you remember from Chapter 1, sometimes a correlation is the result of a third variable, which is the cause of both of the two variables that correlate. Since people who do not spank their children tend have more education than people who do, SES may be the real reason children who are not spanked tend to do better in school. A study that attempted to parcel out all the possible third variables between punishment style and later development found a much smaller correlation between spanking and future problems than most other studies report (Ferguson, 2013).

What might be wrong with spanking? One problem is the emotions of the adult, as angry spankers sometimes become abusive. Another problem is the child's cognition. Many children do not understand the reason behind the spanking. Parents assume the transgression is obvious, but many children think the parents' emotions, not the child's actions, triggered the spanking (Harkness et al., 2011).

Almost all the research finds that children who are spanked continue to suffer in many ways. They are more depressed, more antisocial, more likely to hate school, and less likely to have close friends. While critical thinking demands that we consider all sides until the evidence is clear, one developmentalist says, "We know enough now to stop hitting our children" (Gershof, 2013, p. 133). Most other child advocates agree.

Yet the evidence is not clear enough to satisfy everyone. For example, one study of parents who attend religiously conservative Protestant churches found that, as expected, they spanked their children more often than other parents did. However, unexpectedly, children spanked during early (but not middle) childhood did not develop the lower self-esteem and increased aggression that has been found with other spanked children (Ellison et al., 2011). Indeed, the opposite was more likely.

Many studies of children from all family constellations find that physical punishment of young children correlates with delayed theory of mind and increased aggression (Olson et al., 2011). To prove cause without a doubt would require parents of monozygotic twins to raise them identically, except that one twin would be spanked often and the other never. Of course, that is unethical as well as impossible.

Nonetheless, most developmentalists wonder why parents would take the chance. The best argument in favor of spanking is that alternative punishments may be worse (Larzelere et al., 2010). Let us consider other options.

Response for Parents of 3-Year-Olds (from page 337): Remember, authoritative parents listen but do not usually give in. A parent could ask why the child did not want the Pooh sandals (ugly? too tight? old?) and explain why the "other shoes" were not appropriate (raining? save for special occasions? hard to walk in?). A promise for the future (e.g., "Let's save your other shoes and pretty dress for the birthday party tomorrow") might stop the "Noooo."

Psychological Control

A common method of discipline is called **psychological control,** in which children's shame, guilt, and gratitude are used to control their behavior (Barber, 2002). Psychological control may reduce academic achievement and emotional understanding, just as spanking is thought to do (Alegre, 2011).

psychological control A disciplinary technique that involves threatening to withdraw love and support and that relies on a child's feelings of guilt and gratitude to the parents.

Consider the results of a several studies in Finland, in which parents were asked about psychological control (Aunola et al., 2013). If parents strongly agreed with the following questions, they were considered to use psychological control:

1. "My child should be aware of how much I have done for him/her."
2. "I let my child see how disappointed and shamed I am if he/she misbehaves."
3. "My child should be aware of how much I sacrifice for him/her."
4. "I expect my child to be grateful and appreciate all the advantages he/she has."

The authors of the study suggest that, since spanking was the norm, conservative Protestant children do not perceive being spanked as stigmatizing or demeaning. Moreover, spanking may be accompanied by induction: Religious leaders also tell parents to explain transgressions, to assure children that they are loved, and never to spank in anger. As a result, their children may view mild-to-moderate corporal punishment as legitimate, appropriate, and even a sign of parental involvement, commitment, and concern (Ellison et al., 2011, p. 957).

As I write these words, I realize that the opposing perspective is mine. As you saw in the opening of this chapter, I believe that children should never be hit. I am one of many developmentalists convinced that alternatives to spanking are better for the child as well as a safeguard against abuse.

But a dynamic-systems view considers discipline as one aspect of a complex web. A multi-cultural understanding makes it apparent that, whenever cultures differ radically about any aspect of child development, it is wise to reflect before judging.

I do not think children should be spanked. Yet I know that I am influenced by my background and context; I also know that I am not always right. Whatever your opinion, consider the alternatives.



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She understands? Children who are spanked remember the pain and anger, but not the reason for the punishment. It is better for parents to explain what the misbehavior was. However, sometimes explanations are not understood.

The higher the parents scored on these four measures of psychological control, the lower the children's math scores were—and this connection grew stronger over time. Moreover, the children tended to have negative emotions (depression, anger, and so on).

Time-Out and Induction

A disciplinary technique often used with young children in North America is the **time-out,** in which an adult requires a misbehaving child to sit quietly, without toys or playmates, for a short time. Time-out is favored by many experts. For example, in the large, longitudinal evaluation of the Head Start program highlighted in Chapter 9, an increase in time-outs and a decrease in spankings were considered signs of improved parental discipline (U.S. Department of Health and Human Services, 2010).

time-out A disciplinary technique in which a child is separated from other people for a specified time.

The crucial idea behind time-out is that it not be done in anger, or for too long; it is recommended that parents use a calm voice and that the time-out last only one to five minutes (Morawska & Sanders, 2011). It works as a punishment if the child really enjoys "time-in," when the child is happily engaged with the parents or with peers. Time-outs must not be done with hostility.

Often combined with the time-out is another alternative to physical punishment and psychological control—**induction,** in which the parents talk extensively with the offender, helping the child understand why his or her behavior was wrong. Ideally, time-out allows the child to calm down, and a strong and affectionate parent–child relationship allows the child to explain his or her emotions and the parent to listen carefully. The parent then encourages the child to imagine what he or she *might have* done instead of what *was* done.

induction A disciplinary technique in which the parent tries to get the child to understand why a certain behavior was wrong. Listening, not lecturing, is crucial."

Such conversation helps children internalize standards, but induction takes time and patience. Since 3-year-olds confuse causes with consequences, they cannot answer an angry "Why did you do that?" or appreciate a lengthy explanation of why the behavior was wrong. Simple induction ("You made him sad") may be more appropriate, but even that is hard before a child develops theory of mind.

Nonetheless, induction seems to pay off over time. Children whose parents used induction when they were 3 years old became children with fewer externalizing problems in elementary school (Choe et al., 2013b).



Bad Boy or Bad Parent? For some children and in some cultures, sitting alone is an effective form of punishment. Sometimes, however, it produces an angry child without changing the child's behavior.

// **Response for Parents** (from page 338): No. The worst time to spank a child is when you are angry. You might seriously hurt the child, and the child will associate anger with violence. You would do better to learn to control your anger and develop other strategies for discipline and for prevention of misbehavior.

SUMMING UP Children's moral development often advances during early childhood, as they develop empathy while their theory of mind advances and their emotions become better regulated. New empathy usually helps a child act prosocially, making the child able to share, take turns, and so on. Children can also increasingly develop antipathy, another emotion that indicates cognitive advances. All young children are sometimes aggressive, engaging in instrumental (to get something) or reactive aggression. Those who hurt other children without a self-protective reason are bullies and need to learn more prosocial ways to act.

Parents, guided by their culture, teach morality in many ways. One way is that children learn from parents' strategies for discipline, sometimes learning the wrong lesson, such as that people who are stronger can hurt other people. Every means of punishment may have long-term effects, with physical punishment especially criticized for encouraging aggression. Psychological control seems better, in that it discourages externalizing problems, but it may increase internalizing difficulties. Time-out and induction are generally thought to be best, but individual and cultural differences affect the efficacy of every mode of discipline.

WHAT HAVE YOU LEARNED?

1. What did Piaget believe about the moral development of children?
2. How might evolutionary theory explain moral development?
3. What is the nature perspective on how people develop morals?
4. What is the nurture perspective on how people develop morals?
5. How might children develop empathy and antipathy as they play with one another?
6. What is the connection between empathy and prosocial behavior?
7. What are the four kinds of aggression?
8. How does moral development relate to discipline?
9. Why have some nations made corporal punishment illegal?
10. How could psychological control be harmful?
11. When and how would time-out and induction be most effective?

SUMMARY

Emotional Development

1. Learning to regulate and control emotions is crucial during early childhood. Emotional regulation is made possible by maturation of the brain, as well as by experience.
2. In Erikson's psychosocial theory, the crisis of *initiative versus guilt* occurs during early childhood. Children normally feel pride, sometimes mixed with feelings of guilt. Self-concept develops; preschoolers think they are quite wonderful.
3. Both externalizing and internalizing problems signify impaired self-control. Some emotional problems that indicate psychopathology are first evident during early childhood.

Play

4. All young children enjoy playing—preferably with other children of the same sex, who teach lessons in social interaction that their parents do not.
5. Active play takes many forms, with rough-and-tumble play fostering social skills and sociodramatic play fostering emotional regulation.

Challenges for Caregivers

6. Three classic styles of parenting have been identified: authoritarian, permissive, and authoritative. Generally, children are more successful and happier when their parents are authoritative, expressing warmth and setting guidelines.
7. A fourth style of parenting, neglectful/uninvolved, is always harmful. The particulars of parenting reflect the culture as well as the temperament of the child.
8. Awareness of gender differences begins early, particularly in clothes, toys, playmates, and future careers.
9. Freud emphasized that children are attracted to the opposite-sex parent and eventually seek to identify, or align themselves, with the same-sex parent. Behaviorists hold that gender-related behaviors are learned through reinforcement, punishment (especially for males), and social modeling.
10. Cognitive theorists note that preoperational thinking leads to gender schemas and therefore stereotypes. Sociocultural theorists stress that cultures vary a great deal in the specific of gender norms, and children learn from what they observe.
11. Universal theories note that in all cultures, humans have the powerful need to belong to their group; evolutionary theory contends that gender differences aid the reproduction of the species.

Moral Development

12. Both nature and nurture affect moral development, which is intertwined with emotional regulation and the emergence of empathy. Throughout early childhood, children develop standards of right and wrong.
13. Prosocial emotions lead to caring for others; antisocial emotions lead to harming others. Patterns of behavior, learned in early childhood, continue later in childhood and beyond.
14. Punishments can have long-term consequences. Both corporal punishment and psychological control may have adverse effects. Time-out and induction may be more effective.

KEY TERMS

emotional regulation (p. 311)
effortful control (p. 312)
initiative versus guilt (p. 312)
self-concept (p. 312)
intrinsic motivation (p. 314)
extrinsic motivation (p. 314)
imaginary friends (p. 314)
psychopathology (p. 316)
externalizing problems (p. 316)
internalizing problems (p. 316)
rough-and-tumble play (p. 320)
sociodramatic play (p. 321)
authoritarian parenting (p. 324)
permissive parenting (p. 324)
authoritative parenting (p. 324)
neglectful/uninvolved parenting (p. 324)
sex differences (p. 327)
gender differences (p. 327)
phallic stage (p. 328)
Oedipus complex (p. 328)
superego (p. 328)
Electra complex (p. 328)
identification (p. 328)
gender schema (p. 330)
empathy (p. 334)
antipathy (p. 334)
prosocial behavior (p. 334)
antisocial behavior (p. 334)
instrumental aggression (p. 335)
reactive aggression (p. 335)
relational aggression (p. 336)
bullying aggression (p. 336)
corporal punishment (p. 337)
psychological control (p. 339)
time-out (p. 340)
induction (p. 340)

APPLICATIONS

In all three cases, record data and then draw conclusions.

1. Children's television programming is rife with stereotypes. Watch an hour of children's TV and describe the content of both the programs and the commercials.
2. Gender indicators often go unnoticed. Go to a public place and quantify gender differences, such as articles of clothing, mannerisms, interaction patterns, and activities.
3. Ask three parents about punishment, both how they were punished and how they punish, at what age, and for what.

PART 3

The Developing Person So Far:
Early Childhood





CLAUDIA REWALD/GETTY IMAGES

BIOSOCIAL

Body Changes Children continue to grow from ages 2 to 6, but at a slower rate. Normally, the BMI (body mass index) is lower at about ages 5 and 6 than at any other time of life. Children often eat too much unhealthy food and refuse to eat certain other foods altogether. Parents do not realize that appetites are small.

Brain Development and Motor Skills The proliferation of neural pathways continues and myelination is ongoing. Parts of the brain (e.g., the corpus callosum, prefrontal cortex, amygdala, hippocampus, and hypothalamus) connect. This not only also leads to a decline in impulsivity and perseveration but also allows lateralization of the brain's left and right hemispheres and better coordination of the left and right sides of the body, facilitating motor skill development.

Injuries and Maltreatment Far more children worldwide die of avoidable accidents than of diseases. All forms of child maltreatment—including abuse and neglect—require primary, secondary, and tertiary prevention. Neighborhood stability, parental education, income support, and fewer unwanted children reduce maltreatment. Parents are the most common abusers, but everyone in the community can help with prevention



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COGNITIVE

Thinking During Early Childhood Piaget stressed the young child's egocentric, illogical perspective, which prevents the child from grasping concepts such as conservation. Vygotsky stressed the cultural context, noting that children learn from mentors—which include parents, teachers, peers—and from the social context. Children develop their own theories, including a theory of mind, as they realize that not everyone thinks as they do.

Language Learning Language develops rapidly. By age 6, the average child knows 10,000 words and demonstrates extensive grammatical knowledge. Young children can learn two (or more) languages equally well during these years if their social context is encouraging. Mistakes, in overregularization, in pronunciation, and in precise use of vocabulary are common.

Early-Childhood Schooling Young children are avid learners. Child-centered, teacher-directed, and intervention programs, such as Head Start, can all nurture learning; the outcome depends on the warmth and skill of teachers and on the specifics of the curriculum.



MARCUS LINDSTROM/GETTY IMAGES

PSYCHOSOCIAL

Emotional Development Self-esteem is usually high during early childhood. Self-concept emerges in Erikson's stage of *initiative versus guilt,* as does the ability to regulate emotions. Externalizing problems may be the result of too little emotional regulation; internalizing problems may result from too much control

Play All young children play, and they play best with peers. Rough and tumble and dramatic play are particularly likely to foster emotional regulation, empathy, and cultural understanding.

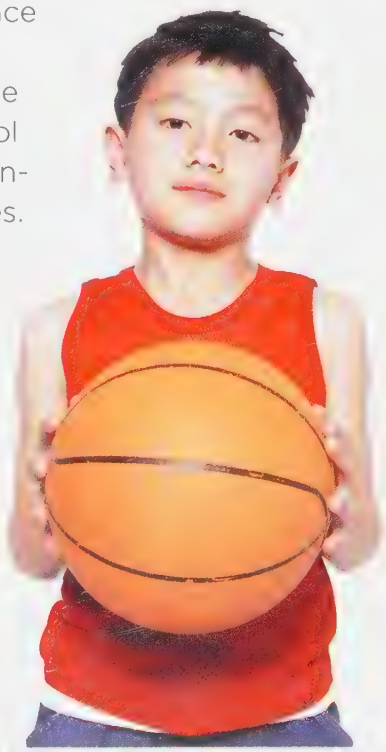
Challenges for Caregivers The authoritative caregiving style—which is warm and encouraging, with good communication as well as high expectations—is most effective in promoting the child's self-esteem, autonomy, and self-control. The authoritarian and permissive styles are less beneficial, although cultural variations are apparent. Children develop stereotypic concepts of sex (biological) and gender (cultural); current developmental theories give contradictory explanations Morals develop in response to cultural norms and practices.



middle childhood

Every age has joys and sorrows, gains and losses. But if you were pushed to choose one best time, you might select ages 6 to 11. In middle childhood, many people experience good health and steady growth as they master new athletic skills, learn thousands of words, and enter a wider social world than that of younger children. Life is safe and happy; the dangers of adolescence (drugs, early sex, violence) are still distant.

But that is not always true. For some, these years are the worst, not the best. They hate school or fear home; they may suffer with asthma or learning disabilities, or they may be the victim of bullies. Adults argue over what occurs during these years: Should children with special needs take medication? What do international tests signify? How are children affected by single parenthood, divorce, or cohabitation? The next three chapters describe these joys and problems.





LEFT: GM VISUALS/GETTY IMAGES
RIGHT: GEORGE DOYLE/GETTY IMAGES

CHAPTER 11

Middle Childhood: Biosocial Development



What Will You Know?

1. What would happen if more parents let their children "go out and play"?
2. Should the epidemic of childhood obesity be blamed on parents, schools, or policies?
3. Why are IQ tests not used as often as they were a few decades ago?
4. How helpful are diagnosis, special education, and medication for children with special needs?

- A Healthy Time
  - Slower Growth, Greater Strength
  - Physical Activity
- Health Problems in Middle Childhood
  - Childhood Obesity
  - A VIEW FROM SCIENCE: What Causes Childhood Obesity?
  - Asthma
- Brain Development
  - Coordinating Connections
  - Measuring the Mind
- Developmental Psychopathology
  - Special Needs in Middle Childhood
  - Attention-Deficit/Hyperactivity Disorder
  - A CASE TO STUDY: Lynda is Getting Worse
  - Specific Learning Disorders
  - Autism Spectrum Disorder
- Special Education
  - Labels, Laws, and Learning
  - Gifted and Talented

My daughter seemed lonely in the early weeks of first grade. Her teacher told me that she was admired, not rejected, and that she might become friends with Alison, who was also shy and bright. I spoke to Alison's mother, a friendly, big-boned woman named Sharon, and we arranged a play date. Soon Bethany and Alison became best friends, as the teacher had predicted, and their friendship has lasted for years.

Unpredicted, however, is that Sharon became my friend. She and her husband, Rick (an editor of a fashion magazine), had one other child, a pudgy boy two years older.

When my daughter and Alison were in fifth grade, I mentioned to Rick my interest in longitudinal research. He recalled a friend, a professional photographer, who took pictures of Alison and her brother every year. The friend wanted them for his portfolio; Rick was happy to oblige. He then retrieved an old album with stunning depictions of sibling relationships and personality development from infancy on. Alison was smiling and coy, even as an infant, and her brother was gaunt and serious until Alison was born, when he seemed to relax.

Rick was happy with my interest; Sharon was not.

"I hate that album," she said, slamming it shut. She explained that she told the pediatrician that she thought her baby boy was hungry, but the doctor insisted she stick to a four-hour breast-feeding schedule and told her to never give him formula. That's why she hated that album; it was evidence of an inexperienced mother heeding a doctor while starving her son.

Decades later, my daughter and I are still friends with Alison and Sharon, whose adult son is obese. His photo as a thin, serious infant haunts me now as well.

Did Sharon cause his obesity by underfeeding him when he was little, or by overfeeding him later on? Or did his genes and culture interact in a destructive way? Or was he rebelling against his father, whose profession glorifies appearance?

This chapter begins our description of middle childhood, which is usually a happy time. This chapter also describes some problems of this period, and the interaction of genes and environment that cause them. Consequences and solutions are complex:

Sharon and Rick are not the only aging parents who still wonder what they could have done differently and how they can help their adult children now. I wonder, too.

A Healthy Time

middle childhood The period between early childhood and early adolescence, approximately from ages 6 to 11.

Genes and environment safeguard **middle childhood,** as the years from about 6 to 11 are called (Konner, 2010). Fatal diseases and accidents are rare; both nature and nurture make these years the healthiest of the entire life span. In the United States in 2012, the death rate for 5- to 14-year-olds was half the rate for 1- to 4-year-olds and one-fifth the rate for 15- to 24-year-olds.

The reasons are (1) genetic diseases are more threatening in early infancy or old age than in middle childhood, (2) infectious diseases are kept away via immunization, and (3) fatal accidents—although the most common cause of death in early childhood—are rare until adolescence.

The already low death rate has been further reduced recently. For example, in the United States in 1950, the death rate per 100,000 children aged 5 to 14 was 60; in 2010, it was 13. Even the incidence of minor illnesses, such as ear infections, infected tonsils, and flu, has been reduced, in part because of better medicine and immunization (National Center for Health Statistics, 2013).

Slower Growth, Greater Strength

Unlike infants or adolescents, school-age children grow slowly and steadily. Self-care is easy—from dressing to bathing, from making lunch to getting to school. Brain maturation allows children to sit and learn in class without breaking their pencils, tearing their papers, or elbowing their classmates. In these middle years, children are much more self-sufficient than younger children and not yet troubled by adolescent body changes.

Teeth

Important to the individual child is the loss of baby teeth, with the entire set replaced by permanent teeth beginning at about age 6 (with girls a few months ahead of boys) and complete by puberty.

Important to society is oral health overall. Worldwide sixty years ago, many children neither brushed their teeth nor saw a dentist, and fluoride was almost never added to water. That's why many of the oldest-old have missing teeth, as do some younger adults because of disease (especially diabetes) or trauma. In developed nations, teeth are replaced with implants or dentures; in poor nations, many of the elderly have gaps in their mouths or visible gold teeth—a sign of wealth in nations where good dentists were scarce.

Currently, most school-age children brush their teeth, and many communities—including all the larger U.S. cities—add fluoride to drinking water. According to a national survey, about 75 percent of U.S. children saw a dentist for preventive care in the past year, and for 70 percent of them, the condition of their teeth was very good (Iida & Rozier, 2013).

Children's Health Habits

Good childhood habits protect later adult health. The health that most school-age children naturally enjoy may either continue or be disrupted, depending on daily actions, including eating a balanced diet, getting enough exercise and sleep, and breathing clean air. Unfortunately, children who have poor health for economic or social reasons (such as no regular medical care) are vulnerable lifelong, even

if their socioeconomic status improves later on, because of epigenetic factors in childhood (Miller & Chen, 2010; Blair & Raver, 2012).

Children's habits during these years are strongly affected by peers and parents. When children see others routinely care for their health, social learning pushes them to do the same. Camps for children with asthma, cancer, diabetes, sickle cell anemia, and other chronic illnesses are particularly beneficial because the example of other children and the guidance of knowledgeable adults help children learn self-care. Such care needs to become routine—not a matter of parental insistence—in childhood, lest teenage rebellion leads to ignoring special diets, pills, warning signs, and doctors (Dean et al., 2010; Naughton et al., 2014).

Physical Activity

Beyond the sheer fun of playing, the benefits of physical activity—especially games with rules, which school-age children are now able to follow—can last a lifetime. Exercise not only improves physical health and reduces depression, it may also improve academic achievement (Efrat, 2011; Carlson et al., 2008).

How could body movement improve brain functioning? A review of the research suggests several possible mechanisms, including direct benefits of better cerebral blood flow and increased neurotransmitters, as well as the indirect results of better mood (Singh et al., 2012).

A new concept in psychology is *embodied cognition*, that human thoughts are affected by body health, comfort, position and so on. If this is true, then a well-functioning body helps thinking. In addition, playing games with other children teaches cooperation, problem-solving, and respect for teammates and opponents, who may be of many backgrounds. Where can children reap these benefits?



DAVID MERCADO/REUTERS/CORBIS

Expert Eye–Hand Coordination The specifics of motor-skill development in middle childhood depend on the culture. These flute players are carrying on the European Baroque musical tradition that thrives among the poor, remote Guarayo people of Bolivia.

Neighborhood Games

Neighborhood play is flexible. Rules and boundaries are adapted to the context (out of bounds is "past the tree" or "behind the parked truck"). Stickball, touch football, tag, hide-and-seek, and dozens of other running and catching games go on forever—or at least until dark. The play is active, interactive, and inclusive—ideal for children. It also teaches ethics. As one scholar notes:

> Children play tag, hide and seek, or pickup basketball. They compete with one another but always according to rules, and rules that they enforce themselves without recourse to an impartial judge. The penalty for not playing by the rules is not playing, that is, social exclusion.
>
> *[Gillespie, 2010, p. 298]*

For school-age children, "social exclusion" is a steep price to pay for insisting on their own way. Instead, most cooperate.

Unfortunately, modern life has undercut informal neighborhood games. Vacant lots and empty fields have largely disappeared, and parents fear "stranger danger"—thinking that a stranger will somehow hurt their child (which is exceedingly rare) and ignoring the many benefits of outside play, which are universal. As one advocate of more unsupervised, creative childhood play sadly notes:

> Actions that would have been considered paranoid in the '70s—walking third-graders to school, forbidding your kid to play ball in the street, going down the slide with your child in your lap—are now routine.
>
> *[Rosin, 2014]*



HENRIK WELS CULTURA CORBIS

Idyllic Two 8-year-olds, each with a 6-year-old sister, all four daydreaming or exploring in a very old tree beside a lake in Denmark—what could be better? Ideally, all the world's children would be so fortunate, but most are not.

Indoor activities such as homework, television, and video games crowd out outdoor play, partly because parents always want to see where their children are and what they are doing.

Many parents enroll their children in organizations that offer—depending on the culture—tennis, karate, cricket, rugby, baseball, or soccer. Unfortunately, in every nation, childhood sports leagues are less likely to include children of low SES or children with disabilities. As a result, the children most likely to benefit are least likely to participate, even when enrollment is free. The reasons are many, the consequences sad (Dearing et al., 2009). Another group unlikely to participate are older girls, again a group particularly likely to benefit from athletic activity (Kremer et al., 2014).

Exercise in School

When opportunities for neighborhood play are scarce, physical education in school is a logical alternative However, because schools are pressured to focus on test scores in academic subjects, time for physical education and recess has declined. A study of Texas elementary schools found that 24 percent had no recess at all and only 1 percent had recess several times a day (W. Zhu et al., 2010).

Texas, unfortunately, is no exception. A survey asking teachers of more than 10,000 third-graders nationwide found that about one-third of the children had less than 15 minutes of recess each day. Children deprived of recess were more often lower SES, in classes that were "hard to manage," in public schools, and in cities. They also had fewer scheduled gym periods (Barros et al., 2009).

These researchers write that "many children from disadvantaged backgrounds are not free to roam their neighborhoods or even their own yards unless they are accompanied by adults. For many of these children, recess periods may be the only opportunity for them to practice their social skills with other children" (Barros et al., 2009, p. 434). Thus, school exercise is least likely for children who most need it—city-dwellers who live in crowded urban neighborhoods, with fearful parents who don't let them go out to play.

Even when gym is required, classes may be too crowded to allow extensive active play, or the school may implement gym on paper but not in practice. For instance, although Alabama requires elementary schools to have daily physical education for at least 30 minutes, a study of all primary schools in one district found that only 22 minutes a day was actually devoted to gym. None of the schools had recess or after-school sports (Robinson et al., 2014). One reason for the lack of after-school sports is that schools fear liability if children are hurt.

Several organizations have developed guidelines to prevent concussions among 7- and 8-year-olds in football practice, as well as to halt full-body impact among children under age 12 playing ice hockey. The fact that regulations need to protect



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"Just remember, son, it doesn't matter whether you win or lose—unless you want Daddy's love."

children from brain damage is sobering (Toporek, 2012). Of course, games for young children could be designed to prevent injury, but the usual reaction from adults is to provide protective equipment, such as better helmets for young players.

Ironically, schools in Japan, where many children score well on international tests, usually have several recess breaks totaling more than an hour each day. Japanese public schools typically have good equipment for physical activity, including an indoor gym and a pool.



Why Helmets? Sports organized by adults, such as this football team of 7- to 8-year-old boys sponsored by the Lyons and Police Athletic League of Detroit, may be harmful to children. The best games are those that require lots of running and teamwork—but no pushing or shoving.

Especially for Physical Education Teachers
A group of parents of fourth- and fifth-graders have asked for your help in persuading the school administration to sponsor a competitive sports team. How should you advise the group to proceed? (see response, page 355)

SUMMING UP School-age children are usually healthy, strong, and capable. Genes as well as immunization protect them against contagious diseases, and medical awareness and care have improved over the past decades. This is particularly evident in oral health. Moreover, children's maturation adds strength, understanding, and coordination, and enables them to undertake self-care and learn health habits to sustain them lifelong. Although neighborhood play, school physical education, and community sports leagues all provide needed activity, energetic play is much more likely for some children than for others. Unfortunately, those who need it most are the least likely to have it.

WHAT HAVE YOU LEARNED?

1. What physical abilities emerge from age 6 to age 11?
2. How do childhood health habits affect adult health?
3. What are the main advantages and disadvantages of physical play during middle childhood?
4. How do children benefit from physical education in school?

Health Problems in Middle Childhood

Some chronic health conditions, including Tourette syndrome, stuttering, and allergies, often worsen during the school years. Even minor problems—wearing glasses, repeatedly coughing or blowing one's nose, or having a visible birthmark—can make children self-conscious, interfering with friendship formation.

Researchers increasingly recognize "that the expression and outcome for any problem will depend on the configuration and timing of a host of surrounding circumstances" (Hayden & Mash, 2014, p. 49). Parents and children are not merely reactive: In a dynamic-systems manner, individuals and contexts influence each other. Consider two examples: obesity and asthma.

Childhood Obesity

Body mass index (BMI) is a measure of body fat that depends on how heavy a person is at their height. **Childhood overweight** is usually defined as a BMI above the 85th percentile, and **childhood obesity** is defined as a BMI above the 95th percentile for children at a particular age. In 2012, 18 percent of 6- to 11-year-olds in the United States were obese (Ogden et al., 2014).

childhood overweight In a child, having a BMI above the 85th percentile, according to the U.S. Centers for Disease Control's 1980 standards for children of a given age

childhood obesity In a child, having a BMI above the 95th percentile, according to the U.S. Centers for Disease Control's 1980 standards for children of a given age

VISUALIZING DEVELOPMENT

Childhood Obesity Around the Globe

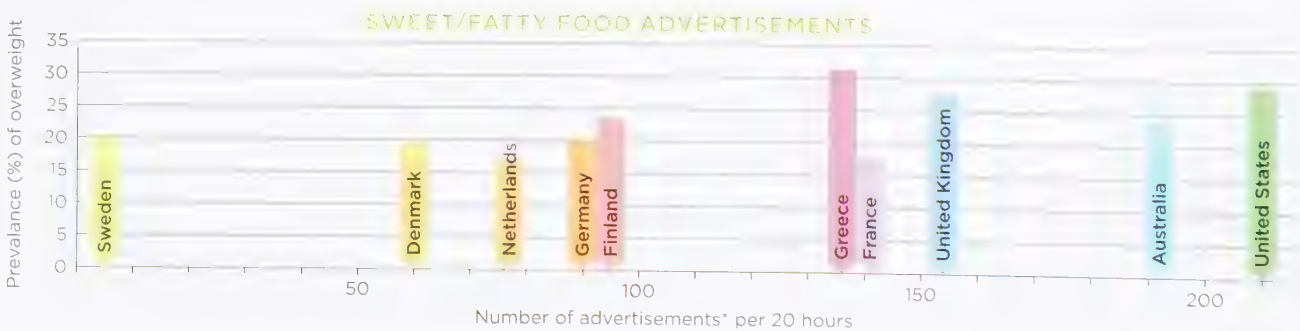
Obesity now causes more deaths worldwide than malnutrition. Reductions are possible. A multi-faceted prevention effort—including mothers, preschools, pediatricians, grocery stores, and even the White House—has reduced obesity in the United States for 2- to 5-year-olds. It was 13.9 percent in 2002 and was 8.4 percent in 2012. However, obesity rates from age 6 to 60 remain high everywhere.



DATA FROM NG ET AL. 2014

ADS AND OBESITY

Nations differ in children's exposure to televised ads for unhealthy food. The amount of this advertising continues to correlate with childhood obesity (e.g., Hewer, 2014). Parents can reduce overweight by limiting screen time and playing outside with their children. The community matters as well: When neighborhoods have no safe places to play, rates of obesity soar.



DATA FROM BOLE ET AL. 2005

WORLD HEALTH ORGANIZATION (WHO) RECOMMENDATIONS FOR PHYSICAL ACTIVITY FOR CHILDREN

1. Children ages 5 to 17 should be active for at least an hour a day.
2. More than an hour of exercise each day brings additional benefits.
3. Most physical activity should be aerobic. Vigorous activities should occur 3 times per week or more.

WHO also recommends daily exercise for adults of every age—including centenarians.

ADAPTED FROM WORLD HEALTH ORGANIZATION 2011

Childhood obesity is increasing worldwide, having more than doubled since 1980 in all three nations of North America (Mexico, the United States, and Canada) (Ogden et al., 2011). Since 2000, rates seem to have leveled off in the United States and have actually declined in preschool children, but for older children, they continue to increase in most nations, including the most populous two, China and India (Gupta et al., 2012; Ji et al., 2013) (see Visualizing Development, p. 352).

Childhood overweight correlates with asthma, high blood pressure, and elevated cholesterol (especially LDL, the "lousy" cholesterol). As excessive weight builds, average school achievement decreases, self-esteem falls, and loneliness rises (Harrist et al., 2012).

Especially for Teachers A child in your class is overweight, but you are hesitant to say anything to the parents, who are also overweight, because you do not want to offend them. What should you do? (see response, page 356)

Especially for Parents Suppose that you always serve dinner with the television on, tuned to a news broadcast. Your hope is that your children will learn about the world as they eat. Can this practice be harmful? (see response, page 356)

a view from science

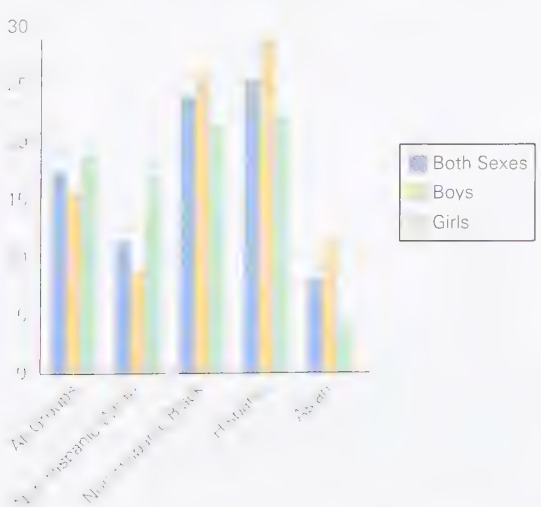
What Causes Childhood Obesity?

There are "hundreds if not thousands of contributing factors" for childhood obesity, from the cells of the body to the norms of the society (Harrison et al., 2011, p. 51). Dozens of genes affect weight by influencing activity level, hunger, food preferences, body type, and metabolism. New genes and alleles that affect obesity—and that never act alone—are discovered virtually every month (Dunmore, 2013).

Knowing that genes are involved may slow down the impulse to blame people for being overweight. However, genes cannot explain why obesity rates have increased dramatically, since genes change little from one generation to the next (Harrison et al., 2011). Instead, cohort changes must be responsible.

Look at the figure on obesity among 6- to 11-year-olds in the United States (see Figure 11.1).

Percent of Obese Children, Age 6–11, in the United States



At first glance, one might think that the large ethnic gaps (such as 9 percent of Asian Americans and 26 percent of Hispanic Americans) might be genetic. But consider gender: Non-Hispanic white *girls* are twice as likely to be obese as boys, but in the other groups *boys* are more often obese than girls. Something cultural, not biological, must be the reason. Further evidence that social context, not genes, affects obesity was found in a study that controlled for family income and early parenting: Ethnic differences in childhood obesity almost disappeared (Taveras et al., 2013).

What parenting practices make children too heavy? Obesity rates rise if: infants are not breast-fed and begin eating solid foods before 4 months; preschoolers have televisions in their bedrooms and drink high quantities of soda; school-age children sleep too little but have several hours each day of "screen time" (TV, videos, games), rarely playing outside (Hart et al., 2011; Taveras et al., 2013).

Although family habits in infancy and early childhood can set a child on the path to obesity, during middle childhood, children themselves have *pester power*—the ability to get adults to do what they want (Powell et al., 2011). Often they pester their parents to buy calorie-dense foods that are advertised on television.

On average, family contexts changed for the worse toward the end of the twentieth century in North America and are spreading worldwide. For instance, family size has decreased, and as a result, pester power has increased, and

FIGURE 11.1

Fatter and Fatter The incidence of obesity (defined here as a BMI above the 95th percentile, according to the Centers for Disease Control and Prevention 2000 growth charts) increases with age. Infants and preschoolers have lower rates than schoolchildren, which suggests that nurture is more influential than nature.

more food is available for each child. That makes childhood obesity collateral damage from reduction of birth rate—a worldwide trend in the early twenty-first century.

Attempts to limit sugar and fat clash with the goals of many corporations, since snacks and processed foods are very profitable. On the plus side, many schools have policies that foster good nutrition. A national survey in the United States found that schools are reducing all types of commercial food advertising. However, vending machines are still prevalent in high schools, and free food coupons are often used as incentives in elementary schools (Terry-McElrath et al., 2014).

Overall, simply offering healthy food is not enough to convince children to change their diet; context and culture are crucial (Hanks et al., 2013). Communities can build parks, bike paths, and sidewalks, and nations can decrease subsidies for sugar and corn oil and syrup. As educators try to improve children's eating habits, cultural sensitivity is crucial, since each ethnic group has preferred foods and family patterns. To work against culture is foolish, but working within cultures can protect the children.

For example, African American parents may consider fried fish and potatos part of their culture, but so are baked fish and a variety of greens; Mexican American parents may enjoy rice and beans, but those can be cooked without added fat. Immigrants who want to "eat American" may not be aware of the correlation between fast food and childhood obesity (Alviola et al., 2013).

Home cooking is usually better. In the United States, older adults who immigrated after childhood have lower rates of obesity than do the native born, yet their children are more often obese than other children, a statistic that should give everyone pause.

Rather than trying to zero in on any single factor, a dynamic-systems approach is needed: Many factors, over time, make a child overweight (Harrison et al., 2011). Changing just one factor is not enough. The answer to the second "What Will You Know?" question at the start of this chapter: Everyone is to blame.


HUSE/GETTY IMAGES


BLUOMMAGE/GETTY IMAGES

Same Situation, Far Apart Children have high energy but small stomachs, so they enjoy frequent snacks more than big meals. Yet snacks are typically poor sources of nutrition. Who is healthier: the Hispanic children eating lollypops at a theme park in Florida or the Japanese children eating *takoyaki* (an octopus dumpling) as part of a traditional celebration near Tokyo?

Asthma

asthma A chronic disease of the respiratory system in which inflammation narrows the airways from the nose and mouth to the lungs, causing difficulty in breathing. Signs and symptoms include wheezing, shortness of breath, chest tightness, and coughing.

- **Asthma** is a chronic inflammatory disorder of the airways that makes breathing difficult. Sufferers have periodic attacks, sometimes requiring a rush to the hospital emergency room, a frightening experience for children who know that asthma might kill them (although it almost never does in childhood).

In the United States, childhood asthma rates have tripled since 1980. (See Figure 11.2 for current rates for those younger than 18 years old.) Parents report that 14 percent of U.S. 5- to 11-year-olds have been diagnosed with asthma at some time, and about 9 percent still suffer from it (National Center for Health Statistics, 2013).

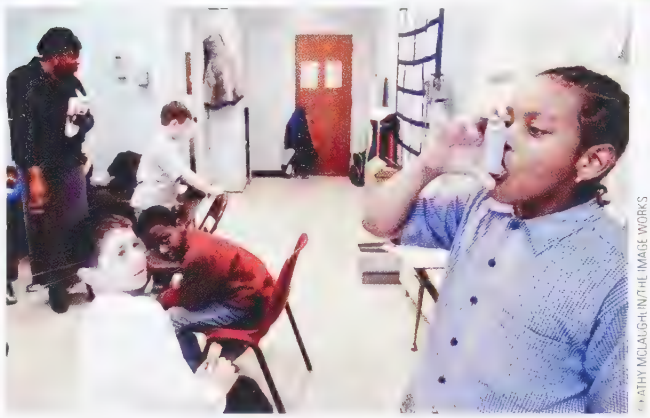
Researchers have long sought the causes of asthma. A few alleles have been identified as contributing factors, but none acts in isolation. Several aspects of modern life—carpets, pollution, house pets, airtight windows, parental smoking, cockroaches, dust mites, less outdoor play—correlate with asthma attacks, but no single factor is the sole trigger. Some children are more susceptible to certain allergens, and a combination of sensitivity to allergies, early respiratory infections, and compromised lung functioning increases wheezing and shortness of breath (Mackenzie et al., 2014).

Some experts suggest a *hygiene hypothesis*: that "the immune system needs to tangle with microbes when we are young" (Leslie, 2012, p. 1428). Children may be overprotected from viruses and bacteria. In their concern about hygiene, parents prevent exposure to minor infections, diseases, and family pets that would strengthen their child's immunity. This hypothesis is supported by data showing that (1) first-born children develop asthma more often than later-born ones; (2) asthma and allergies are less common among farm children; and (3) children born by cesarean delivery (very sterile) have a greater incidence of asthma. Overall, it may be "that despite what our mothers told us, cleanliness sometimes leads to sickness" (Leslie, 2012, p. 1428).

None of these factors, however, *proves* the hygiene hypothesis. Perhaps farm children are protected by drinking unpasteurized milk, by outdoor chores, or by alleles that are more common in farm families, rather than by exposure to a range of bacteria (von Mutius & Vercelli, 2010). In fact, there are "many paths to asthma," with no one cause identified as the crucial one (H. Kim et al., 2010). One review of the hygiene hypothesis notes "the picture can be dishearteningly complex" (Couzin-Frankel, 2010, p. 1168).

However, there is hope. Consider a study of 133 Latino adult smokers, all caregivers of children with asthma. They agreed to allow a Spanish-speaking counselor to come repeatedly to their homes (Borrelli et al., 2010). The counselor placed a smoke monitor in the child's bedroom. A week later she told the caregiver how much smoke exposure the child had experienced. Then, in three sessions, she provided specific suggestions for how to quit smoking, based on research on addiction, with particular sensitivity to Latino values.

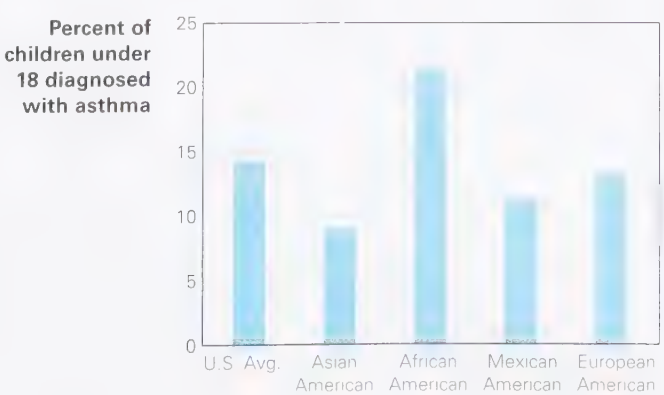
Three months later, one-fourth of the caregivers had quit smoking completely, and many of the rest had cut down. The average child's exposure to smoke was cut in half, and asthma attacks diminished (Borrelli et al., 2010). Having data on their child and getting personal encouragement was crucial.



© KATHY MCLAUGHLIN/THE IMAGE WORKS

Pride and Prejudice In some city schools, asthma is so common that using an inhaler is a sign of pride, as may be true here. The "prejudice" is beyond the walls of this school nurse's room, in a society that allows high rates of childhood asthma.

Response for Physical Education Teachers (from page 351): Discuss with the parents their reasons for wanting the team. Children need physical activity, but some aspects of competitive sports are better suited to adults than to children.

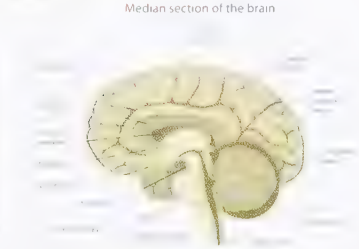


Source: National Center for Health Statistics, 2013.

FIGURE 11.2

Not Breathing Easy Of all U.S. children younger than 18, 14 percent have been diagnosed at least once with asthma. Why are Puerto Rican and African American children more likely to have asthma? Does the answer have to do with nature or nurture, genetics, or pollution?

LaunchPad



ALAMY/CAMMDA SHUTTERST...

Video Activity: Brain Development: Middle Childhood depicts the changes that occur in a child's brain from age 6 to age 11.

SUMMING UP Some children have chronic health problems that interfere with school and friendship. Among these are obesity and asthma, both of which are increasing in every nation and have genetic and environmental causes. Childhood obesity may seem harmless, but it leads to social problems among classmates and severe health problems later on. Asthma's harm is more immediate: Children with asthma often miss school and may be rushed to emergency rooms, gasping for air. Although genes predispose some children to each particular health problem, family practices and neighborhood context can increase rates of obesity and asthma, and many society-wide policies and cultural customs make the problems worse.

WHAT HAVE YOU LEARNED?

1. What are the national and cohort differences in childhood obesity?
2. Why does a thin 6-year-old not need to "fatten up"?
3. What roles do nature and nurture play in childhood asthma?
4. Why is childhood asthma a concern for developmentalists?

Brain Development

Recall that emotional regulation, theory of mind, and left–right coordination emerge in early childhood. The maturing corpus callosum connects the hemispheres of the brain, enabling balance and two-handed coordination, while myelination adds speed. Maturation of the prefrontal cortex—the executive part of the brain—allows the child to begin to plan, monitor, and evaluate. All of these neurological developments continue. We now look at additional advances in middle childhood.

Coordinating Connections

Increasing maturation results in connections between the various lobes and regions of the brain. Such connections are crucial for the complex tasks that children must master, which require "smooth coordination of large numbers of neurons" (Stern, 2013, p. 577). Certain areas of the brain, called *hubs*, are locations where massive numbers of axons meet. Hubs tend to be near the corpus callosum, and damage to them correlates with brain dysfunction (as in dementia and schizophrenia) (Crossley et al., 2014).

The importance of hubs means that the brain connections formed in middle childhood are crucial for healthy brain functioning. Particularly important are links between the hypothalamus and the amygdala, because emotions need to be regulated so learning can occur. Stress impairs these connections: Slow academic mastery in middle childhood is one more consequence of early maltreatment (Hanson et al., 2014).

One example of the need for brain connections is learning to read, perhaps the most important intellectual accomplishment of middle childhood. Reading is not instinctual: Our ancestors never did it, and until recent centuries, only a few scribes and scholars could make sense of marks on paper. Consequently, the brain has no areas dedicated to reading, the way it does for talking or gesturing (Sousa, 2014).

Instead, reading uses many parts of the brain—one for sounds, another for recognizing letters, another for sequencing, another for comprehension and more. By working together, those parts first foster listening, talking, and thinking, and then put it all together (Lewandowski & Lovett, 2014). Indeed, every skill mastered in middle childhood requires connections between many neurons in several brain regions.

Response for Teachers (from page 353): Speak to the parents, not accusingly (because you know that genes and culture have a major influence on body weight) but helpfully. Alert them to the potential social and health problems their child's weight poses. Most parents are very concerned about their child's well-being and will work with you to improve the child's snacks and exercise levels.

Response for Parents (from page 353): Habitual TV watching correlates with obesity, so you may be damaging your children's health rather than improving their intellect. Your children would probably profit more if you were to make dinner a time for family conversation about world events.

Think Quick; Too Slow

Advance planning and impulse control are aided by faster **reaction time,** which is how long it takes to respond to a stimulus. Increasing myelination reduces reaction time every year from birth until about age 16. Skill at games is an obvious example, from scoring on a video game, to swinging at a pitch, to kicking a speeding soccer ball toward a teammate.

reaction time The time it takes to respond to a stimulus, either physically (with a reflexive movement such as an eyeblink) or cognitively (with a thought).

Many more complex examples involve social and academic skills. For instance, being able to discern when to utter a witty remark and when to stay quiet is something few 6-year-olds can do. By age 10, some children have quick reactions, allowing them to (1) realize that a comment could be made and (2) decide what it could be, (3) think about the other person's possible response, and in the same split second (4) know when something should NOT be said.

Both quick replies and quick inhibition develop. Children become less likely to blurt out wrong answers but more likely to enjoy games that require speed. Interestingly, children with reading problems are slower as well as more variable in reaction time, and that itself slows down every aspect of reading (Tamm et al., 2014).

selective attention The ability to concentrate on some stimuli while ignoring others.

Pay Attention

Neurological advances allow children not only to process information quickly but also to pay special heed to the most important elements of their environment. **Selective attention,** the ability to concentrate on some stimuli while ignoring others, improves markedly at about age 7.

School-age children not only notice various stimuli (which is one form of attention) but also select appropriate responses when several possibilities conflict (Wendelken et al., 2011). Selective attention improves as neurological maturity continues (Stevens & Bavelier, 2012).

For example in school, children listen, take notes, and ignore distractions (all difficult at age 6, easier by age 10). Unfazed by the din of the cafeteria, children react quickly to gestures and facial expressions. On the baseball diamond, older batters ignore the other team's attempts to distract them, and fielders start moving into position as soon as the bat hits the ball.



PRESSMASTER/SHUTTERSTOCK

Pay Attention Some adults think that computers can make children lazy, because they can look up whatever they don't know. But imagine the facial expressions of these children if they were sitting at their desks with 30 classmates, listening to a lecture.

Automatization

One final advance in brain function in middle childhood is **automatization,** the process by which a sequence of thoughts and actions is repeated until it becomes automatic. At first, almost all behaviors that are deliberate require careful thought. After many repetitions, neurons fire in sequence, and less thinking is needed because the firing of one neuron sets off a chain reaction: That is automatization.

automatization A process in which repetition of a sequence of thoughts and actions makes the sequence routine, so that it no longer requires conscious thought.

Consider again learning to read. At first, eyes (sometimes aided by a guiding finger) focus intensely, painstakingly making out letters and sounding out each one. This leads to the perception of syllables and then words. Eventually, the process becomes so routine that as people drive along on a highway, they read billboards that they have no interest in reading. Children do the same, gradually learning to read without conscious control.

Automatic reading aids other academic skills. One longitudinal study of second-graders—from the beginning to the end of the school year—found a reciprocal process from one type of academic proficiency to another, with automatic processing advancing as learning continues (Lai et al., 2014).

Learning to speak a second language, to recite the multiplication tables, and to write one's name also is slow at first but gradually becomes automatic. Habits and routines learned in childhood are useful lifelong—and when they are not, they are hard to break. That's automatization.

Measuring the Mind

In ancient times, if adults were strong and fertile, that was usually enough to be considered a solid member of the community. A few wise men were admired, but most people were not expected to think quickly and profoundly. Over the centuries, though, we humans have placed higher and higher values on intelligence, and have developed ways to measure it.

Aptitude, Achievement, and IQ

aptitude The potential to master a specific skill or to learn a certain body of knowledge.

In theory, **aptitude** is the potential to master a specific skill or to learn a certain body of knowledge. The brain functions which have just been described—reaction time, selective attention, and automatization—may be the foundation of aptitude, whether the specific aptitude is the ability to become a proficient soccer player, seamstress, chef, student, or whatever.

Measuring the brain directly is complicated, however. Therefore, intellectual aptitude is usually measured by answers to a series of questions. The underlying assumption is that there is one general thing called *intelligence* (often referred to as *g*, for general intelligence) and that correct answers measure *g*.

Originally, IQ tests produced a score that was literally an Intelligence Quotient: Mental age (the average chronological age of children who answer a certain number of questions correctly) was divided by the chronological age of the child who took the test. The result of that division (the quotient) was multiplied by 100.

Thus if the average 10-year-old answered say, exactly 60 questions correctly, then people who got 60 questions right would have a mental age of 10—no matter how old they were. Anyone whose mental age was the same as their chronological age (in this example, a 10-year-old who got 60 questions right) the quotient would be $10 \div 10 = 1$. The IQ would be 100 (1×100), exactly average.

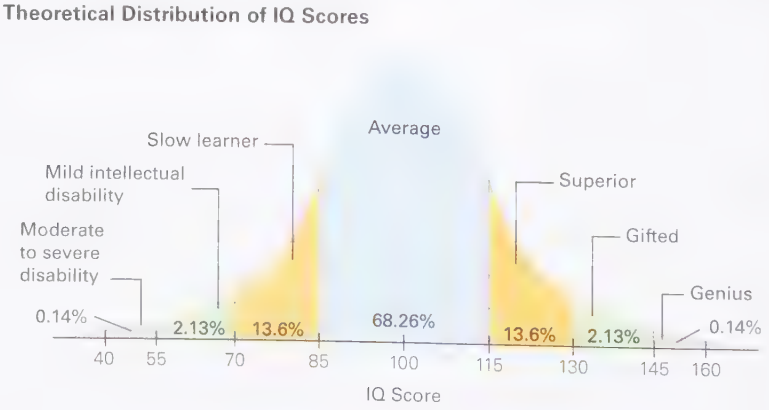
OBSERVATION QUIZ If a person's IQ is 110, what category is he or she in? (see answer, page 360)

If a 10-year-old answered the questions as well as a typical 12-year-old, the score would be $12 \div 10 \times 100$, or 120. The current method of calculating IQ is more complex, but an IQ within one standard deviation of 100 (between 85 and 115) is still considered average (see Figure 11.3).

FIGURE 11.3

In Theory, Most People Are Average

Almost 70 percent of IQ scores fall within the normal range. Note, however, that this is a norm-referenced test. In fact, actual IQ scores have risen in many nations; 100 is no longer exactly the midpoint. Furthermore, in practice, scores below 50 are slightly more frequent than indicated by the normal curve shown here because severe disability is not the result of normal distribution, but of genetic and prenatal factors.



In theory, achievement is what has actually been learned, not learning potential (aptitude). School **achievement tests** compare scores to norms established for each grade. For example, children of any age who read as well as the average third-grader would be at the third-grade level in reading achievement.

achievement test A measure of mastery or proficiency in reading, mathematics, writing, science, or some other subject.

The words *in theory* precede the definitions of *aptitude* and *achievement* above because, although potential and accomplishment are supposed to be distinct, the data find substantial overlap. IQ and achievement scores are strongly correlated.

It was once assumed that aptitude was a fixed characteristic, present at birth. Longitudinal data show otherwise. Young children with a low IQ can become above average or even gifted adults, like my nephew David (discussed in Chapter 1). Indeed, the average IQ scores of entire nations have risen substantially every decade for the past century—a phenomenon called the **Flynn effect,** named after the researcher who first described it (Flynn, 1999, 2012).

Flynn effect The rise in average IQ scores that has occurred over the decades in many nations.

Most psychologists now agree that the brain is like a muscle, affected by mental exercise—which often is encouraged or discouraged by the social setting. Brain structures grow or shrink depending on past learning. This is proven in language and music and probably is true in other areas as well (Zatorre, 2013). During middle childhood, speed of thought is crucial for high IQ, with working memory also influential (Demetriou et al., 2013). Both speed and memory are affected by experience, evident in the Flynn effect.



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Typical 7-Year-Old? In many ways this boy is typical. He likes video games and school, he usually appreciates his parents, he gets himself dressed every morning. This photo shows him using blocks to construct a design to match a picture, one of the ten kinds of challenges that comprise the WISC, a widely used IQ test. His attention to the task is not unusual for children his age, but his actual performance is more like that of an older child. That makes his IQ score significantly above 100.

Criticisms of Testing

Since scores change over time, IQ tests are much less definitive than they were once thought to be. Some scientists doubt whether any single test can measure the complexities of the human brain, especially if the test is designed to measure *g*, one general aptitude. According to some experts, children inherit many abilities, some high and some low, rather than any *g* (e.g., Q. Zhu et al., 2010).

Two leading developmentalists (Sternberg and Gardner) are among those who believe that humans have **multiple intelligences,** not just one. Gardner originally described seven intelligences: linguistic, logical-mathematical, musical, spatial, bodily-kinesthetic (movement), interpersonal (social understanding), and intrapersonal (self-understanding), each associated with a particular brain region (Gardner, 1983). He subsequently added an eighth (naturalistic: understanding nature, as in biology, zoology, or farming) and a ninth (spiritual/existential: thinking about life and death) (Gardner, 1999, 2006; Gardner & Moran, 2006).

multiple intelligences The idea that human intelligence is composed of a varied set of abilities rather than a single, all-encompassing one.

Especially for Teachers What are the advantages and disadvantages of using Gardner's nine intelligences to guide your classroom curriculum? (see response, page 361)

Although every normal person has some of all nine intelligences, Gardner believes each individual excels in particular ones. For example, someone might be gifted spatially but not linguistically (a visual artist who cannot describe her work) or might have interpersonal but not naturalistic intelligence (an astute clinical psychologist whose houseplants die). Gardner's concepts regarding multiple intelligences influence the curriculum in many primary schools. For instance, children might be allowed to demonstrate their understanding of a historical event via a poster with drawings instead of writing a paper with a bibliography.

Sternberg described three kinds of intelligence: analytic, creative, and practical (1985, 2011). He contends that schools emphasize analysis (academics), but that creative and practical intelligence should also be valued. He added a fourth type of intelligence —called wisdom— as crucial in adulthood. He writes:

(from page 358): He or she is average. Anyone with a score between 85 and 115 has an average IQ.

> One needs creativity to generate novel ideas, analytical intelligence to ascertain whether they are good ideas, practical intelligence to implement the ideas and persuade others of their value, and wisdom to ensure that the ideas help reach a common good.
>
> *[Sternberg, 2012, p. 21]*

Gardner, Sternberg, and many other scholars find that cultures and families dampen or encourage particular intelligences. For instance, if two children are born with creative, musical intelligence, the child whose parents are musicians is more likely to develop musical intelligence than a child whose parents are tone-deaf.

Every test reflects the culture of the people who create, administer, and take it. This is obvious for achievement tests: A child may score low because of home, school, or culture, not because of ability. Indeed, IQ tests are still used partly because achievement tests do not necessarily reflect aptitude.

Scores on aptitude tests are also influenced by culture. Some experts have tried to develop tests that are culture-free, asking children to identify pictures, draw shapes, repeat stories, hop on one foot, name their classmates, sort objects, and so on.

An obvious precaution, required by most IQ tests, is that a friendly, trained adult ask questions of an individual student, in order to avoid cultural test-taking skills. Yet experience still matters. For example, some children are told to never talk to strangers, and so they do not answer the examiner's questions.

Brain Scans

One way to indicate aptitude is to measure the brain directly, avoiding the cultural biases of written exams or individual questions. Brain scans do not correlate with scores on IQ tests in childhood, but they do in adolescence (Brouwer et al., 2014). That suggests that one or the other of these tests is flawed when measuring the intelligence of children. The brain seems to have several localized hubs and lobes, which suggests multiple intelligence, but overall speed of reaction seems a characteristic of the entire brain, which may underlie *g*. Variation is vast in children's brains, which makes experts hesitant to argue for any one interpretation of IQ tests and brain scans (e.g., Goddings & Giedd, 2014).

For example, although it seems logical that less brain activity means less intelligence, that is not always the case. In fact, automatization reduces the need for brain activity, so the smartest children might have less active brains. Another puzzle is that a thicker cortex sometimes correlates with high IQ, but cortex thinness predicts greater vocabulary in 9- to 11-year-olds (Menary et al., 2013; Karama et al., 2009; G. Miller, 2006). Brain patterns in creative children differ from those who score high on IQ tests (Jung & Ryman, 2013). These results are puzzling—but so is much brain research.

Neuroscientists agree, however, on three conclusions:

1. Brain development depends on specific experiences. Thus, a brain scan is accurate only for the moment at which is done.
2. Brain development continues throughout life: Middle childhood is a crucial time, but developments before and after these years are also significant for brain functioning.
3. Children with disorders often have unusual brain patterns, and training their brains may help. However, brain complexity and normal variation mean that diagnosis and remediation are far from perfect.

This leads to the final topics of this chapter, children with special needs and how they should be taught.



SUMMING UP During middle childhood, neurological maturation allows faster, more automatic reactions. Selective attention enables focused concentration in school and in play. IQ tests, which measure aptitude for learning, compare mental age to chronological age. Actual learning is measured by achievement tests.

As children and cultures adapt to changing contexts, IQ scores change much more than was originally imagined. Some scientists believe that certain abilities, perhaps speed of thought and working memory, undergird general intelligence, known as *g*. However, the concept that intelligence arises from one underlying aptitude is challenged by several scientists who believe that people have not just one type of intelligence but multiple intelligences. Further challenges to traditional IQ tests come from social scientists, who find marked cultural differences in what children are taught to do, and from neuroscientists, who see that brain activity does not reliably correlate with IQ scores.

WHAT HAVE YOU LEARNED?

1. Why does quicker reaction time improve the ability to learn?
2. How does selective attention make it easier for a child to sit in a classroom?
3. When would a teacher give an aptitude test instead of an achievement test?
4. If the theory of multiple intelligences is correct, should IQ tests be discarded? Why or why not?
5. Which intellectual abilities are more valued than others in the United States? Give examples.
6. Should brain scans replace traditional intelligence tests? Why or why not?

Response for Teachers (from page 359): The advantages are that all the children learn more aspects of human knowledge and that many children can develop their talents. Art, music, and sports should be an integral part of education, not just a break from academics. The disadvantage is that they take time and attention away from reading and math, which might lead to less proficiency in those subjects on standard tests and thus to criticism from parents and supervisors.

Developmental Psychopathology

Some children have special needs because of their brain and behavior patterns. **Developmental psychopathology** links the study of usual development with the study of special needs (Cicchetti, 2013b; Hayden & Mash, 2014). Every topic already described, including "genetics, neuroscience, developmental psychology, . . . must be combined to understand how psychopathology develops and can be prevented" (Dodge, 2009, p. 413).

developmental psychopathology The field that uses insights into typical development to understand and remediate developmental disorders.

At the outset, four general principles should be emphasized.

1. *Abnormality is normal.* Most children sometimes act oddly. At the same time, children with serious disorders are, in many respects, like everyone else.
2. *Disability changes year by year.* Most disorders are **comorbid,** which means that more than one problem is evident in the same person. Which particular disorder is most disabling at a particular time changes, as does the degree of impairment.
3. *Life may be better or worse in adulthood.* Prognosis is difficult. Many children with severe disabilities (e.g., blindness) become productive adults. Conversely, some conditions (e.g., conduct disorder) may become more disabling.
4. *Diagnosis and treatment reflect the social context.* Each individual interacts with the surrounding setting—including family, school, community, and culture—to modify, worsen, or even create psychopathology.

comorbid Refers to the presence of two or more unrelated disease conditions at the same time in the same person.

Special Needs in Middle Childhood

Developmental psychopathology is relevant lifelong because "[e]ach period of life, from the prenatal period through senescence, ushers in new biological and psychological challenges, strengths, and vulnerabilities" (Cicchetti, 2013b, p. 458). Turning points, opportunities, and past influences are always apparent.

However in middle childhood, children are grouped by age. For some parents and teachers it suddenly becomes obvious that a particular child differs markedly from others the same age. Fortunately, the effects of most disorders can be mitigated if treatment is early and properly targeted.

Therein lies a problem: Although early treatment is more successful, early and accurate diagnosis is difficult, not only because many disorders are comorbid but also because symptoms differ by age. As you learned in Chapter 7, infants have temperamental differences that might or might not become problems, and Chapter 10 explained that some aggression is normal. Difference is not necessarily deficit, but that does not mean that all differences are benign.

Two basic principles of developmental psychopathology lead to caution in diagnosis and treatment (Hayden & Mash, 2014; Cicchetti, 2013b). First is **multifinality,** which means that one cause can have many (multiple) final manifestations. For example, an infant who has been flooded with stress hormones may become a hypervigilant or an unusually calm kindergartener, may be easily angered or quick to cry, or may not be affected at all.

multifinality A basic principle of developmental psychopathology that holds that one cause can have many (multiple) final manifestations.

equifinality A basic principle of developmental psychopathology that holds that one symptom can have many causes.

The second principle is **equifinality** (equal in final form), which means that one symptom can have many causes. For instance, a nonverbal child may be autistic, hard of hearing, not fluent in the dominant language, or pathologically shy.

The complexity of diagnosis is evident in the *Diagnostic and Statistical Manual of Mental Disorders,* 5th edition (American Psychiatric Association, 2013), often referred to as DSM-5. A major problem is recognizing the cutoff between normal childish behavior and pathology. Some suggest that childhood psychopathology was underdiagnosed in early editions of the DSM and now is overdiagnosed (Hayden & Mash, 2014). As examples of the many complexities regarding children with special needs, we discuss three particularly common and troubling disorders. Appendix A lists the DSM-5 criteria for these three.

Attention-Deficit/Hyperactivity Disorder

Someone with **attention-deficit/hyperactivity disorder (ADHD)** is often inattentive and unusually active and impulsive, so much so that his or her ability to function is affected. The diagnosis in DSM-5 says symptoms must start before age 12 (in DSM-IV it was age 7) and must impact daily life. (DSM-IV said *impaired,* not just *impacted.*) Thus more children are considered to have ADHD than was the case 10 years ago.

attention-deficit/hyperactivity disorder (ADHD) A condition characterized by a persistent pattern of inattention and/or by hyperactive or impulsive behaviors; ADHD interferes with a person's functioning or development.

Some impulsive, active, and creative actions are normal for children. However, children with ADHD

> are so active and impulsive that they cannot sit still, are constantly fidgeting, talk when they should be listening, interrupt people all the time, can't stay on task, . . . accidentally injure themselves." All this makes them "difficult to parent or teach."
>
> Nigg & Barkley, 2014, p. 75

They tend to have academic difficulties; they are less likely to graduate from high school and college; they become unhappy with themselves and with everyone else.



A River Is Better Than a School People must be quick and active to avoid capsizing in white-water rafting, but these children are up to the task. They have been diagnosed with ADHD; they are quite able to respond to fast-changing currents.

Problems with Diagnosis

There is no biological marker for ADHD. Current research, nonetheless, suggests the origin of the disorder is neurological, with problems in brain regulation either because of genes, complications of pregnancy, or toxins (such as lead) (Nigg & Barkely, 2014).

ADHD is comorbid with other conditions, including biological problems such as sleep deprivation or allergic reactions. Explosive rages, later followed by deep regret, are typical for children with many disorders, including ADHD. One surprising comorbidity is deafness: Children with severe hearing loss often are affected in balance and activity, and that seems to make them prone to developing ADHD (Antoine et al., 2013). In this way, ADHD is an example of equifinality; many causes produce one disorder.



SACRAMENTO BEE/ZUMA PRESS/ZUMA PRESS

Almost Impossible The concentration needed to do homework is almost beyond this boy, age 11, who takes medication for ADHD. Note his furrowed brow, resting head, and sad face.

OBSERVATION QUIZ Is he able to write? (see answer, page 364)

Although the U.S. rates of children with ADHD were about 5 percent in 1980, recent data find that 7 percent of all 4- to 9-year-olds, 13 percent of all 10- to 13-year-olds, and 15 percent of all 14- to 17-year-olds have been diagnosed with ADHD (Schwarz & Cohen, 2013). These numbers are called "astronomical" by one pediatric neurologist (Graf, quoted in Schwarz & Cohen, 2013).

Rates of ADHD in most other nations are lower than in the United States, but they are rising everywhere (e.g., Al-Yagon et al., 2013; Hsia & Maclennan, 2009; van den Ban et al., 2010). Most research finds the highest rates in North America and lowest rates in East Asia (Erskine et al., 2014), but since diagnosis depends on someone's judgment, it is probably not helpful to compare nations. Increases everywhere are worrisome for at least three reasons:

- *Misdiagnosis.* If ADHD is diagnosed when another disorder is the problem, treatment might make the problem worse, not better (Miklowitz & Cicchetti, 2010). Many psychoactive drugs alter moods, so a child with disruptive mood dysregulation disorder (formerly called childhood-onset bipolar disorder) might be harmed by drugs that help children with ADHD.
- *Drug abuse.* Although drugs that reduce the symptoms of ADHD reduce one cause of later drug abuse, some adolescents may use a diagnosis of ADHD in order to obtain amphetamines with a doctor's prescription.
- *Normal behavior considered pathological.* In young children, high activity, impulsiveness, and curiosity are normal. If a normal child is diagnosed as abnormal, that may affect the child's self-concept and adult expectations. Could normal male activity be one reason ADHD is much more common in boys than girls?

Especially for Health Workers Parents ask that some medication be prescribed for their kindergarten child, who they say is much too active for them to handle. How do you respond? (see response, page 365)

Many adults (71 percent in one study) who were diagnosed with ADHD as children say they no longer have the condition (Barbaresi et al., 2013). Do people overcome or outgrow ADHD, or do adults minimize their symptoms, or do parents and teachers over-report?

Treatment for ADHD involves: (1) training for the family and the child, (2) special education for teachers, and (3) medication. But, as equifinality suggests, most disorders vary in causes, so treatment that helps one child does not necessarily work for another (Mulligan et al., 2013).

Drug Treatment for ADHD and Other Disorders

Because many adults are upset by what young children normally do and because any physician can write a prescription to quiet a child, thousands of children may be overmedicated. But because many parents do not recognize that their child

needs help, or they are suspicious of drugs and psychologists (Moldavsky & Sayal, 2013; Rose, 2008), thousands of children may suffer needlessly.

In the United States, more than 2 million people younger than 18 take prescription drugs to regulate their emotions and behavior (see Figure 11.4). The rates are about 14 percent for teenagers (Merikangas et al., 2013), about 10 percent for 6- to 11-year-olds, and less than 1 percent for 2- to 5-year-olds (Olfson et al., 2010). In China, parents rarely use psychoactive medication for children: A Chinese child with ADHD symptoms is thought to need correction rather than medication (Yang et al., 2013). Wise or cruel?

The most commonly prescribed drug for ADHD is Ritalin, but at least 20 other psychoactive drugs treat depression, anxiety, intellectual disability, autism spectrum disorder, disruptive mood dysregulation disorder, and many other conditions in middle childhood. Many child psychologists believe that drugs can be helpful, and they worry that the public discounts the devastation and lost learning that occur when a child's serious disorder is not recognized or treated.

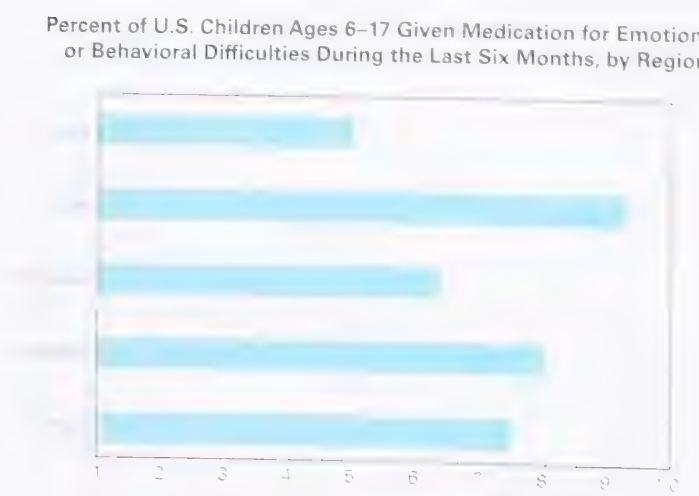
But all agree that finding the best drug at the right strength is difficult, in part because each child's genes and personality are unique, and in part because children's weight and metabolism change every year. Given all that, it is troubling that only half of all children who take psychoactive drugs are evaluated and monitored by a mental health professional (Olfson et al., 2010). Most experts also believe that contextual interventions (instructing parents and teachers on child management) should be tried first (Daley et al., 2009; Leventhal, 2013; Pelham & Fabiano, 2008) and provide the best long-term solution.

Drugs may help, but they are not a cure. In one careful study, when children with ADHD were given appropriate medication, carefully calibrated, they were more able to concentrate. However, eight years later, many had stopped taking their medicine. At this follow-up, both those on medication and those who had stopped taking it often had learning difficulties (Molina et al., 2009).

Ethnic differences are found in parent responses, teacher responses, and treatment for children with ADHD symptoms. In the U.S., it seems that, when African American and Hispanic children are diagnosed with ADHD, their parents are less likely to give them medication compared to European American parents (Morgan et al., 2013). However, genes, culture, health care, education, religion, and stereo-

FIGURE 11.4

One Child In Every Classroom Or maybe two, if the class has more than 20 students or is in Alabama. This figure shows the percent of 6- to 17-year-olds prescribed psychoactive drugs in the previous six months. About half of these children have been diagnosed with ADHD, and the rest have anxiety, mood, and other disorders. These data are averages gathered from many communities. In fact, some schools (even in the South) have very few medicated children, and others (even in the West) have many in every class. The regional variations evident here are notable, but much more dramatic are rates by school, community, and doctor—some of whom are much quicker to medicate children than others.



Source: NCHS, May 2, 2014

types could all affect ethnic differences. As two experts explain, "disentangling these will be extremely valuable to improving culturally competent assessment in an increasingly diverse society" (Nigg & Barkely, 2014, p. 98).

When appropriately used, drugs for ADHD may help children make friends, learn in school, feel happier, and behave better. These drugs also seem to help adolescents and adults with ADHD (Surman et al., 2013). However, as the just-cited longitudinal study found, problems do not disappear: Adolescents and adults who were diagnosed with ADHD as children are less successful academically and personally, whether or not they were medicated (Molina et al., 2013). Drugs do not erase special needs. Consider the following case.

Response for Health Workers (from page 363): Medication helps some hyperactive children but not all. It might be useful for this child, but other forms of intervention should be tried first. Compliment the parents on their concern about their child, but refer them to an expert in early childhood for an evaluation and recommendations. Behavior-management techniques geared to the particular situation, not medication, are the first strategy.

a case to study

Lynda Is Getting Worse

Even experts differ in diagnosis of problems and recommended treatments. For instance, one study asked 158 child psychologists—half of them from England and half from the United States—to diagnose an 11-year-old girl with the following symptoms.

> Parents say Lynda has been hyperactive, with poor boundaries and disinhibited behavior since she was a toddler. . . . Lynda has taken several stimulants since age 8. She is behind in her school work, but IQ normal. . . .
>
> At school she is oppositional and "lazy" but not disruptive in class. Psychological testing, age 8, described frequent impulsivity, tendencies to discuss topics unrelated to tasks she was completing, intermittent expression of anger and anxiety, significantly elevated levels of physical activity, difficulties sitting still, and touching everything. Over the past year Lynda has become very angry, irritable, destructive and capricious. She is provocative and can be cruel to pets and small children. She has been sexually inappropriate with peers and families, including expressing interest in lewd material on the Internet, *Playgirl* magazine, hugging and kissing peers. She appears to be grandiose, telling her family that she will be attending medical school, or will become a record producer, a professional wrestler, or an acrobat. Throughout this period there have been substantial marital difficulties between the parents.
>
> *[Dubicka et al., 2008, appendix p. 3]*

Most (81 percent) of the clinicians diagnosing Lynda thought she had ADHD, and most thought she had another disorder as well. The Americans were likely to suggest a second and third disorder, with 75 percent of them specifying bipolar disorder. Only 33 percent of the British psychologists said bipolar (Dubicka et al., 2008).

Clinicians did not finger the family context or teacher's attitudes. This is a serious omission, since, for both nature and nurture reasons, parents who have ADHD or mood disorders are more likely to have children with disorders. It would have made sense for the parents to be tested and treated as well as 8-year-old Lynda. The family context matters. Many studies find that school and home environment can be crucial for a young child with ADHD (Nigg & Barkely 2014).

In this case, her parents thought Lynda had ADHD since toddlerhood; a pediatrician agreed, and at age 8 put her on drugs. Now, at age 11, she seems to be getting worse, not better, while her parents are increasingly hostile to each other. Family interaction, especially a close parental alliance, might have forstalled the problem.

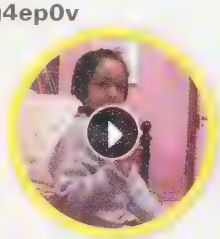
Of course, it is impossible to know what would have happened if intensive intervention had taken place for the entire family when Lynda was a toddler. Might marital problems have been avoided? In any case, the four principles of developmental psychopathology suggest that developmental patterns and social contexts needed to be considered. That might have led to improvement, as apparently three years of medication did not.

Specific Learning Disorders

The DSM-5 diagnosis of **specific learning disorder** now includes disabilities in both perception and processing of information, with lower achievement than expected in reading, math, or writing (including spelling) (Lewandowski & Lovett, 2014). Learning disorders make it difficult for children to master a particular skill that most children acquire easily.

specific learning disorder (learning disability) A marked deficit in a particular area of learning that is not caused by an apparent physical disability, by an intellectual disability, or by an unusually stressful home environment.

Video: Dyslexia: Expert and Children
http://qrs.ly/cg4ep0v

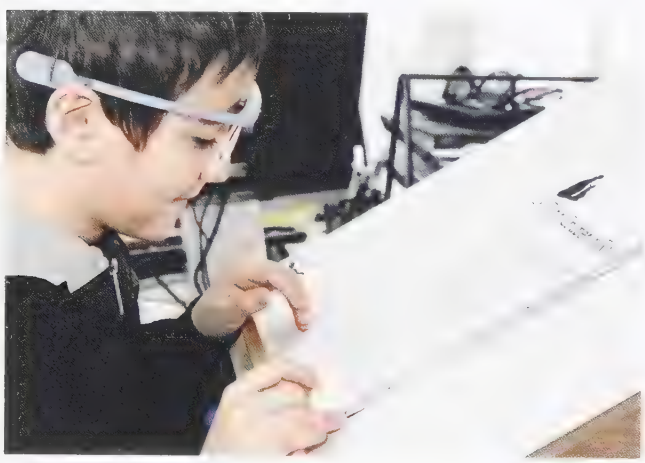


Some learning disabilities are not debilitating (e.g., the off-key singer learns to be quiet in chorus), but as DSM-5 notes, every schoolchild is expected to read, calculate, and write. Disabilities in these areas undercut academic achievement, destroy self-esteem, and qualify a child for special education (according to U.S. law) or formal diagnosis (according to DSM-5). Hopefully, such children find (or are taught) ways to compensate, and other abilities shine. Winston Churchill, Albert Einstein, and Hans Christian Andersen are all said to have had learning disabilities.

Dyslexia

The most commonly diagnosed learning disorder is **dyslexia**—unusual difficulty with reading. No single test accurately diagnoses dyslexia (or any learning disability) because every academic achievement involves many distinct factors (Riccio & Rodriguez, 2007). One child with a reading disability might have trouble sounding out words but might excel in comprehension and memory of printed text; another child might have the opposite problem. Dozens of types and causes of dyslexia have been identified, so no single strategy will help every child with dyslexia (O'Brien et al., 2012).

dyslexia Unusual difficulty with reading; thought to be the result of some neurological underdevelopment



Happy Reading Those large prism glasses keep the letters from jumping around on the page, a boon for this 8-year-old French boy. Unfortunately, each child with dyslexia needs individualized treatment: These glasses help some, but not most, children who find reading difficult.

Early theories hypothesized that visual difficulties—for example, reversals of letters (reading *god* instead of *dog*) and mirror writing (*b* instead of *d*)—were the cause of dyslexia, but we now know that dyslexia more often originates with speech and hearing difficulties (Gabrieli, 2009; Swanson, 2013). An early warning occurs if a 3-year-old does not talk clearly or has not had a naming explosion. (**Developmental Link:** Both explained in Chapter 6.) Early therapy improves speech and might also reduce or prevent later dyslexia.

Traditionally, dyslexia was diagnosed only if a child had difficulty reading despite normal IQ, normal hearing and sight, and normal behavior. This approach usually meant waiting until the third grade or so, when the reading difficulty became apparent. Now difficulty with the basic skills for beginning reading (naming letters and sounds, hearing rhymes) is recognized in kindergarten, and children receive earlier remediation.

Dyscalculia and Dysgraphia

Another common learning disorder is **dyscalculia,** unusual difficulty with math. For example, when asked to estimate the height of a normal room, second-graders with dyscalculia might answer "200 feet," or, when asked which card is higher, the 5 or the 8 of hearts, the child might correctly answer 8—but only after using their fingers to count the number of hearts on each card (Butterworth et al., 2011).

dyscalculia Unusual difficulty with math, probably originating from a distinct part of the brain.

Dyslexia and dyscalculia are often comorbid, although each originates from several distinct parts of the brain. Early encouragement with counting and calculating (long before first grade) can teach a child math basics, limiting dyscalculia and avoiding the emotional stress children feel if other children grasp math more easily (Butterworth et al., 2011).

Similar concerns regard very poor spelling and writing, known as dysgraphia, and again early remediation is useful, because the origin is probably in the brain as well as the social context. Remediation is best done early, at age 6 not age 10, not only because the brain is more flexible but also because the young child's eagerness to learn has not yet been crushed by failure. Every person, learning disabled or not, has strengths and interests, and almost everyone can learn basic skills if they are given extensive and targeted teaching, encouragement, and practice.

Autism Spectrum Disorder

Of all the children with special needs, those with **autism spectrum disorder (ASD)** are probably the most troubling. Their problems are severe, but both causes and treatments are hotly disputed. Thomas Insel, director of the National Institute of Mental Health, describes the parents and other advocates of children with autism as "the most polarized, fragmented community I know" (quoted in Solomon, 2012, p. 280).

Many children with ASD show symptoms in the first year of life, but some seem normal and then suddenly regress at about age 2 or 3, perhaps because a certain level of brain development, or a particular medical insult, occurs (Klinger et al., 2014). Most are diagnosed at age 4 or later (MMWR, March 28, 2014).

autism spectrum disorder (ASD) A developmental disorder marked by difficulty with social communication and interaction—including difficulty seeing things from another person's point of view—and restricted, repetitive patterns of behavior, interests, or activities.

LaunchPad

Video: Current Research into Autism Spectrum Disorder explores why the causes of ASD are still largely unknown.

Symptoms

Autism spectrum disorder is characterized by woefully inadequate social understanding, coupled with repetitive or restrictive patterns of behavior, such as lining up toys by color rather than playing with them, or fascination with trains, lights, or spinning objects. More than a century ago, autism was considered rare, affecting fewer than 1 in 1,000 children with "an extreme aloneness that, whenever possible, disregards, ignores, shuts out anything . . . from the outside" (Kanner, 1943).

Years ago, children who developed slowly, and who would now be likely to be diagnosed with ASD, were usually diagnosed as being "mentally retarded" or as having a "pervasive developmental disorder." (The term "mental retardation," which was used in DSM-IV, has been replaced with "intellectual disability" in DSM-5.)

Much has changed. Far more children are diagnosed with autism spectrum disorder, and far fewer with intellectual disability. In the United States, among 8-year-olds, one child in every 68 is said to have an autism spectrum disorder (MMWR, March 28, 2014). Almost five times as many boys as girls, and about one-third more European Americans than Hispanic, Asian, or African Americans, are diagnosed with autism.

The DSM-5 autism diagnosis, formerly reserved for children who were mute or violent, now includes mild, moderate, or severe categories. Children who once were said to have Asperger syndrome are now said to have "autism spectrum disorder without language or intellectual impairment" (American Psychiatric Association, 2013, p. 32).

Children with any form of ASD find it difficult to understand the emotions of others, which makes them feel alien, like "an anthropologist on Mars," as Temple Grandin, an educator and writer with ASD, expressed it (quoted in Sacks, 1995). Consequently, they are less likely to talk or play with anyone, and they are delayed in developing theory of mind. *Severely impaired* children never speak, rarely smile, and play for hours with one object (such as a spinning top or a toy train). *Mildly impaired* children appear normal at first, and may be talented in some specialized area, such as drawing or geometry. Many (46 percent) score in the 'normal' or 'above normal' range on IQ tests (MMWR, March 28, 2014).

Most children with autism spectrum disorder show signs in early infancy (no social smile, for example, or less gazing at faces and eyes than most toddlers). Some improve by age 3; others deteriorate. Late onset occurs with several brain disorders, including *Rett syndrome*, in which a



Precious Gifts Many children with autism spectrum disorder are gifted artists. This boy attends a school in Montmoreau, France, that features workshops in which children with ASD develop social, play, and learning skills.

newborn girl (boys with the Rett gene never survive) has "normal psychomotor development through the first 5 months after birth," but then her brain develops very slowly, severely limiting movement and language (Bienvenu, 2005).

Many children with ASD have an opposite problem—too much neurological activity, not too little. Their head grows too fast, and by age 2 it is larger than average. Their sensory cortex may be hypersensitive, making them unusually upset by noise, light, and other sensations. That suggests that the core problem in ASD is neurological. Literally hundreds of genes and dozens of brain abnormalities are more common in people diagnosed with autism than in the general population.

As mentioned above, in the United States far more children are found to have ASD now than in 1990. The incidence of this disorder may have actually increased, or the definition has expanded, or more children receive that diagnosis because educational services are more available (Klinger et al., 2014).

Underlying the estimate of frequency is the problem that no definitive measure diagnoses autism spectrum disorder: Many adults are socially inept, insensitive to other people's emotions, and poor at communication—are they all on the spectrum? One expert believes that the reason so many more boys than girls are designated with autism is that females are naturally more empathetic and males more likely to systematize, so biological sex differences protect girls who are genetically vulnerable (Baron-Cohen, 2010).

A related issue is whether autism is a disorder needing a cure, or whether the real problem is in parents and society that expect everyone to be fluent talkers, gregarious, and flexible—the opposite of people with autism. Advocates of **neurodiversity,** suggests that the neurological diversity of human beings is to be accepted, appreciated, even celebrated (Kapp et al., 2013). Do typical humans foolishly want no one to be atypical?

neurodiversity The idea that people have diverse brain structures, with each person having neurological strengths and weaknesses that should be appreciated, in much the same way diverse cultures and ethnicities are welcomed. A person who is adept at numbers and systems but inept in social skills and metaphors might be recognized as having unusual gifts, rather than pitied for having an autism spectrum disorder.

Treatment

The neurodiversity perspective is one reaction to the many treatments that converge on autism. When a child is diagnosed with ASD, parental responses vary from irrational hope to deep despair, from blaming doctors and chemical additives to feeling guilty for what they did wrong. Many parents sue schools, or doctors, or the government; many spend all their money and change their lives; many subject their children to treatments that are, at best, harmless, and at worst, painful and even fatal.

Andrew Solomon (2012) writes about one child, who was medicated with

> Abilify, Topamax, Seroquel, Prozac, Ativan, Depakote, trazodone, Risperdal, Anafranil, Lamictal, Benadryl, melatonin, and the homeopathic remedy, Calms Forté. Every time I saw her, the meds were being adjusted again . . . .[He also describes] physical interventions—putting children in hyperbaric oxygen chambers, putting them in tanks with dolphins, giving them blue-green algae, or megadosing them on vitamins . . . usually neither helpful nor harmful, though they can have dangers, are certainly disorienting, and cost a lot
>
> *[p. 229, 270]*

Equifinality certainly applies to ASD: A child can have autistic symptoms for many reasons; no single gene causes the disorder. That makes treatment difficult; an intervention that seems to help one child proves worthless for another. It is known, however, that biology is crucial (genes, copy number abnormalities, birth complications, prenatal injury, perhaps chemicals during fetal or infant development) and that family nurture is not the cause of ASD but may modify it. Social and language engagement of the child early in life seems the most promising treatment.



SUMMING UP Many children have special learning needs that originate with problems in the development of their brains. Developmental psychopathologists emphasize that no child is typical in every way; the passage of time sometimes brings improvement and sometimes not. Children with attention-deficit/hyperactivity disorder, learning disorders, and autism spectrum disorders may function adequately as adults or may have lifelong problems, depending on many variables, including: (1) the severity of the problem, (2) family support, (3) school strategies, and (4) comorbid conditions. In general, the earlier diagnosis and treatment occurs, the better, but it is during middle childhood that many problems become apparent.

WHAT HAVE YOU LEARNED?

1. How does normal childhood behavior differ between the United States and Asia?
2. What is the difference between multifinality and equifinality?
3. Why is medication recommended for children with ADHD?
4. Why might parents ask a doctor to prescribe Ritalin for their child?
5. What are dyslexia, dyscalculia, and dysgraphia?
6. How might an adult have a learning disability that has never been diagnosed?
7. What are the three primary signs of autism spectrum disorder?
8. What are the implications of neurodiversity?

All Together Now Kiemel Lamb (*top center*) leads children with autism in song, a major accomplishment. For many of these children, music is soothing, words are difficult, and handholding in a group is almost impossible.

Special Education

The overlap of the biosocial, cognitive, and psychosocial domains is evident to developmentalists, as is the need for parents, teachers, therapists, and researchers to work together to help each child. However, deciding whether or not a child should be designated as needing special education is not straightforward, nor is it closely related to specific special needs.



THE TUSCALOOSA NEWS, DUSTY COMPTON/AP PHOTO

Labels, Laws, and Learning

In the United States, recognition that the distinction between normal and abnormal is not clear-cut (the first principle of developmental psychopathology) led to a series of reforms. Dramatic changes occurred in the treatment and education of children with special needs.

According to the 1975 Education of All Handicapped Children Act, children with special needs must be educated in the **least restrictive environment (LRE).** That law has been revised several times, but the goal remains that children should not be segregated from other children unless it is not possible to remediate problems within the regular classroom.

least restrictive environment (LRE) A legal requirement that children with special needs be assigned to the most general educational context in which they can be expected to learn.

Consequently, LRE usually means educating children with special needs in a regular class, a practice once called *mainstreaming*, rather than in a special classroom or school. Sometimes a child is sent for a few hours a week to a *resource room*, with a teacher who provides targeted tutoring. Sometimes a class is an *inclusion class*, which means that children with special needs are "included" in the general classroom, with "appropriate aids and services" (ideally from a trained teacher who works with the regular teacher).

A more recent educational strategy is called **response to intervention (RTI)** (Fletcher & Vaughn, 2009; Shapiro et al., 2011; Ikeda, 2012). All children are

response to intervention (RTI) An educational strategy intended to help children who demonstrate below-average achievement in early grades, using special intervention.

taught specific skills; for instance, learning the sounds that various letters make. Then the children are each tested, and those who did not master the skill receive special "intervention"—practice and individualized teaching, usually within the regular class. Then they are tested again, and, if need be, intervention occurs again. Only when a child does not respond adequately to repeated, focused intervention is the child referred for testing and observation to diagnose the problem.

RTI is used in some nations with success (e.g., Sahlberg, 2011) and is now implemented in many U.S. schools. Most children respond to intervention, but those who do not are then tested to determine if they have special needs. In that case, the school proposes an **individual education plan (IEP)** with the parents.

individual education plan (IEP) A document that specifies educational goals and plans for a child with special needs.

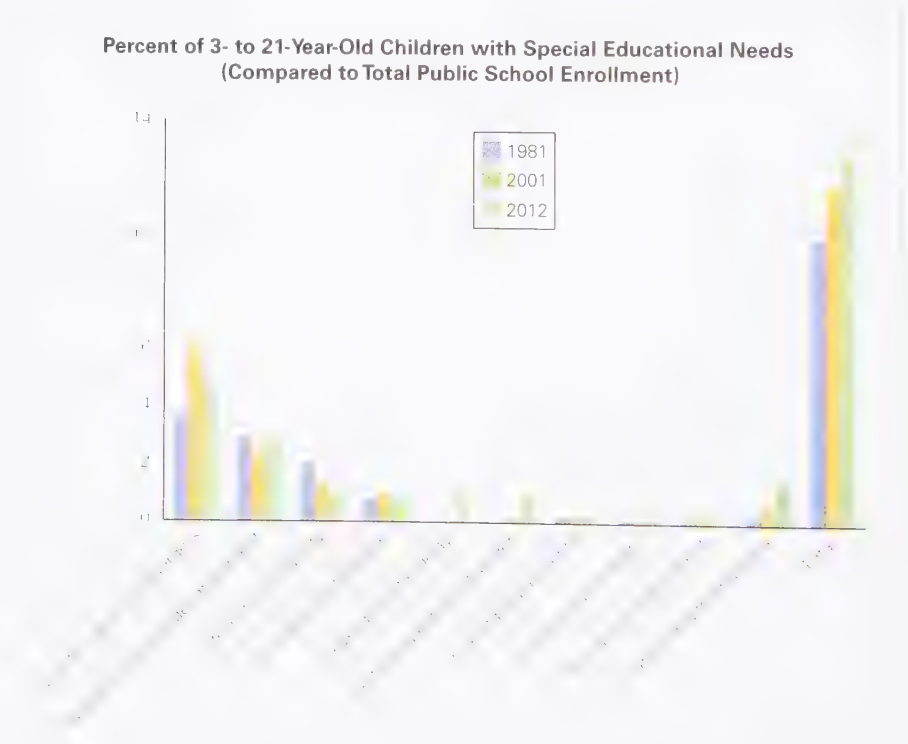
The basic assumption of the IEP is that schools need to "design learning pathways for each individual sufferer." The label, or specific diagnosis, is supposed to help target effective remediation. Yet this rarely occurs in practice (Butterworth & Kovas, 2013, p. 304). Instead, the special needs that attract most research on remediation are not the more common ones. One example: In the United States, "research funding in 2008–2009 for autistic spectrum disorder was 31 times greater than for dyslexia and 540 times greater than for dyscalculia" (Butterworth & Kovas, 2013, p. 304).

In the United States, historical shifts are notable in which children are recognized by educators as having special needs, and what their needs are labeled. As Figure 11.5 shows, the proportion of children designated with special needs rose in the United States from 10 percent in 1980 to 13 percent in 2011, primarily because more children are called learning disabled or autistic (National Center for Education Statistics, 2013b).

There is no separate category for ADHD. To receive special services, children with ADHD are often designated as having a specific learning disorder. Since most disorders are comorbid, the particular special needs category in the school

FIGURE 11.5

Nature or Nurture Communities have always had some children with special needs, with physical, emotional, and neurological disorders. In some eras, and today in some nations, the education of such children was neglected. Indeed, many children were excluded from normal life even before they quit trying. Now in the United States, every child is entitled to school. Categories have changed, probably because of nurture, not nature. Thus, teratogens and changing parental and community practice probably caused the rise in autism spectrum disorder and developmental delay, the decrease in intellectual disability, and the fluctuation in learning disorders apparent here.



Source U.S. Department of Education



system may not be the diagnosis given by a psychologist. One result is that teachers, therapists, and parents may work at cross-purposes to educate a child.

Internationally, the connection between special needs and education varies, again for cultural and historical reasons more than child-related ones (Rotatori et al., 2014). In many African and Latin American nations, almost no child receives special education in public schools; in many Asian nations, diagnosis refers primarily to physical disability. The U.S. school system designates more children as having special needs than does any other nation: Whether this is a reason for national pride or shame depends on one's perspective.

Gifted and Talented

Children who are unusually gifted are often thought to have special needs as well, but they are not covered by federal laws in the United States. Instead, each U.S. state selects and educates gifted and talented children in a particular way, a variation that leads to controversy.

A scholar writes: "The term *gifted* . . . has never been more problematic than it is today" (Dai, 2010, p. 8). Educators, political leaders, scientists, and everyone else argue about who is gifted and what should be done about them. Are gifted children unusually intelligent, or talented, or creative? Should they be skipped, segregated, enriched, or left alone?

A hundred years ago, the definition of gifted was simple: high IQ. A famous longitudinal study followed a thousand "genius" children, all of whom scored above 140 on the Stanford-Binet IQ test (Terman, 1925). Even today, some school systems define gifted as having an IQ of 130 or above (attained by 1 child in 50). Other children are unusually talented, recognized by their parents at a young age, by the general public after they die—but not usually by their teachers when they are in elementary school. Mozart composed music at age 3; Pablo Picasso created works of art at age 4.

A hundred years ago, school placement was simple for high IQ children. They were taught with children who were their mental age, not their chronological age. This practice was called **acceleration.** Today that is rarely done because many accelerated children never learned how to get along with others. As one woman remembers:

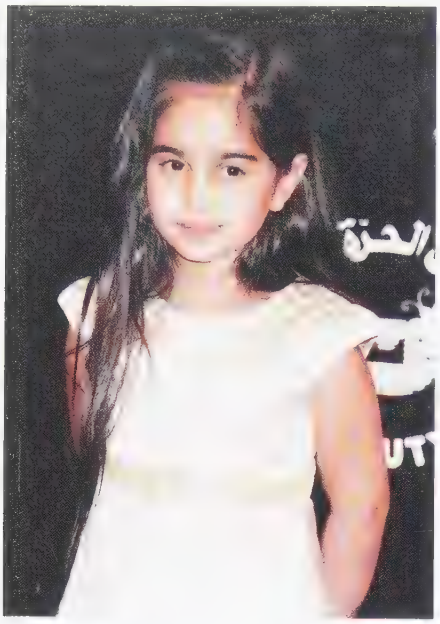
acceleration Educating gifted children alongside other children of the same mental, not chronological, age.

> Nine-year-old little girls are so cruel to younger girls. I was much smaller than them, of course, and would have done anything to have a friend. Although I could cope with the academic work very easily, emotionally I wasn't up to it. Maybe it was my fault and I was asking to be picked on. I was a weed at the edge of the playground.
>
> *[Rachel, quoted in Freeman, 2010, p. 27]*

Calling herself a weed suggests that she never overcame her conviction that she was less cherished than the other children. Her intellectual needs may have been met by her skipping two grades, but her emotional and social needs were severely neglected.

Historically, many famous musicians, artists, and scientists were child prodigies whose fathers recognized their talent (often because the father was talented) and taught them. Often they did not attend regular school, because laws requiring attendance did not exist. Mozart's father transcribed his earliest pieces and toured Europe with his gifted son. Picasso's father removed him from school in second grade so he could create all day.

That solution also had pitfalls. Although intense early education at home nourishes talent, neither Mozart nor Picasso had happy adult lives. Moreover, Picasso said he never learned to read or write, and Mozart had a poor understanding of



Gifted. Then What? Mercan Türkoğlu was awarded a Bambi, the German equivalent of an Oscar, for her star performance in the film *Three Quarter Moon*. She is German of Turkish ancestry, Muslim, and a talented actress. What education will best prepare her for adulthood?

math and money. Similar patterns are still apparent, as exemplified by gifted athletes (e.g., Tiger Woods and Steffi Graf) as well as those in less public specialties. Here is one example:

> Sufiah Yusof started her maths degree at Oxford [the leading University in England] in 2000, at the age of 13. She too had been dominated and taught by her father. But she ran away the day after her final exam. She was found by police but refused to go home, demanding of her father in an email: "Has it ever crossed your mind that the reason I left home was because I've finally had enough of 15 years of physical and emotional abuse?" Her father claimed she'd been abducted and brainwashed. She refuses to communicate with him. She is now a very happy, high-class, high-earning prostitute
>
> *Freeman, 2010, p. 286*

Some children who might need special education are unusually creative (Sternberg et al., 2011). They are *divergent thinkers*, finding many solutions and even more questions for every problem. Such students joke in class, resist drudgery, ignore homework, and bedevil their teachers. They may become innovators, inventors, and creative forces of the future.

Creative children do not conform to social standards. They are not *convergent thinkers*, who choose the correct answer on school exams. One such person was Charles Darwin, whose "school reports complained unendingly that he wasn't interested in studying, only shooting, riding, and beetle-collecting" (Freeman, 2010, p. 283). Other creative geniuses who were poor students are Einstein, Freud, Newton, Steve Jobs. Again, such people are not usually recognized until late in adulthood, or after death.

Neuroscience has recently discovered that children who develop their musical talents with extensive practice in early childhood grow specialized brain structures, as do child athletes and mathematicians. Since plasticity means that children learn whatever their context teaches, special talents may be enhanced with special education, an argument for elementary school teaching to accommodate creative children.

Since both acceleration and intense parental tutoring have led to later problems, a third education strategy has become popular, at least in the United States. Children who are bright, talented, and/or creative—all the same age but each with special abilities—are taught together in their own classroom. Ideally, such children are neither bored nor lonely; each is challenged and appreciated by their classmates.

Classes for gifted students require unusual teachers, smart and creative, able to appreciate divergent thinking and challenge the very bright. They must be flexible: providing a 7-year-old artist freedom, guidance, and inspiration for magnificent art and simultaneously providing patient, step-by-step reading instruction if that same child is a typical new reader. Similarly, a 7-year-old who reads at the twelfth-grade level might have immature social skills, needing a teacher who finds another child to befriend him or her and who then helps both of them share, compromise, and take turns.

Should such teachers be available only for the gifted? Every child may need talented teachers and individualized instruction, no matter what the child's abilities or disabilities may be. Many educators complain that the system of education in the United States, where each school district and sometimes each school hires and assigns teachers, results in the best teachers having the most able students, when it should be the opposite. This trend is furthered by tracking, putting children with special needs together, and allowing private or charter schools to select certain students and leave the rest behind.



Some nations educate all children together, assuming that the best learners are not naturally gifted but are able to work harder at learning. Thus, the teacher's job is to motivate and challenge every child. U.S. law says all children can learn, and it is the job of schools to teach them. Every special and ordinary form of education can benefit by applying what we know about children's minds (De Corte, 2013). That is the topic of the next chapter.

SUMMING UP No child learns or behaves exactly like another, and no educational strategy always succeeds. Various strategies are apparent not only for children with disabilities but also for those who are unusually gifted and talented. Mainstreaming and inclusion of children with special needs occur because educators believe that children benefit from learning with other children. It is not straightforward to balance that belief with the need for some children to have an individual education plan, or a gifted and talented class.

WHAT HAVE YOU LEARNED?

1. What do mainstreaming and inclusion have in common?
2. Why is response to intervention considered an alternative to special education?
3. Why are children who are smarter than their peers no longer allowed to skip grades?
4. What are the arguments for and against special classes for gifted children?

SUMMARY

A Healthy Time

1. Middle childhood is a time of steady growth and few serious illnesses. Increasing independence and self-care allow most school-age children to be relatively happy and competent.
2. Advances in medical care have reduced childhood sickness and death. During these years, health habits, including daily oral care, protect children from later health problems.
3. Physical activity aids health and joy in many ways. However, current social and environmental conditions make informal neighborhood play rare. School physical education is less prevalent than it was formerly. Children who most need physical activity may be least likely to have it.

Health Problems in Middle Childhood

4. Childhood obesity is a worldwide epidemic. Although genes are part of the problem, too little exercise and the greater availability of unhealthy foods are the main reasons today's youth are heavier than their counterparts of 50 years ago. Parents and policies share the blame.
5. The incidence of asthma is increasing overall, with notable ethnic differences. The origins of asthma are genetic; the main triggers are specific environmental allergens, although research on asthma finds marked variation in causes, triggers, and consequences. Preventive measures include longer breast-feeding, increased outdoor play, and less air pollution, particularly from motor vehicles.

Brain Development

6. Brain development continues during middle childhood, enhancing every aspect of development. Notable are advances in reaction time and automatization, allowing faster and better coordination of many parts of the brain and body. Experience enhances coordination of brain impulses.
7. IQ tests quantify intellectual aptitude, which increases in middle childhood. Most such tests emphasize language and logic ability and predict school achievement. IQ scores may change over time, as culture and experience enhance particular abilities.
8. Achievement tests measure accomplishment, often in specific academic areas. Aptitude and achievement are correlated, both for individuals and for nations, and have risen in the past decades.
9. Critics of IQ testing contend that intelligence is manifested in multiple ways, which makes conventional IQ tests that assume *g*, too narrow and limited. Multiple intelligences include creative and practical abilities as well as many skills not usually valued in typical North American schools.

Developmental Psychopathology

10. Developmental psychopathology uses an understanding of normal development to inform the study of unusual development. Four general lessons have emerged: Abnormality is normal; disability changes over time; a condition may get better or worse in adolescence and adulthood; diagnosis depends on context.
11. Children with attention-deficit/hyperactivity disorder (ADHD) have potential problems in three areas: inattention, impulsiveness, and activity. Stimulant medication often helps children with ADHD to learn, but any drug use by children must be carefully monitored.
12. People with a specific learning disorder have unusual difficulty in mastering a specific skill or skills that other people learn easily. The most common learning disorders that impair achievement in middle childhood are dyslexia (unusual difficulty with reading), dyscalculia (unusual difficulty with math), and dysgraphia (unusual difficulty with writing and spelling).
13. Children with autism spectrum disorder typically have problems with social interactions and language. They often exhibit restricted, repetitive patterns of behavior, interests, and activities. Many causes are hypothesized. ASD is partly genetic; no one now views ASD as primarily the result of inadequate parenting. Treatments are diverse and controversial.

Special Education

14. About 13 percent of all school-age children in the United States receive special education services. These services begin with an IEP (individual education plan) and assignment to the least restrictive environment (LRE), usually the regular classroom.
15. A strategy to reduce the number of children with special needs is to notice when children are having difficulty and then providing special help. This strategy, called response to intervention, allows most children to learn.
16. Some children are unusually intelligent, talented, or creative. Many states and nations provide special education for them. The traditional strategy—skipping a grade—no longer seems beneficial. Instead, in the United States, gifted and talented children are usually educated as a special group.

KEY TERMS

middle childhood (p. 348)
childhood overweight (p. 351)
childhood obesity (p. 351)
asthma (p. 354)
reaction time (p. 357)
selective attention (p. 357)
automatization (p. 357)
aptitude (p. 358)
achievement test (p. 359)
Flynn effect (p. 359)
multiple intelligences (p. 359)
developmental psychopathology (p. 361)
comorbid (p. 361)
multifinality (p. 362)
equifinality (p. 362)
attention-deficit/hyperactivity disorder (ADHD) (p. 362)
specific learning disorder (learning disability) (p. 365)
dyslexia (p. 366)
dyscalculia (p. 366)
autism spectrum disorder (ASD) (p. 367)
neurodiversity (p. 368)
least restrictive environment (LRE) (p. 369)
response to intervention (RTI) (p. 369)
individual education plan (IEP) (p. 370)
acceleration (p. 371)

APPLICATIONS

1. Compare outdoor play spaces for children in different neighborhoods—ideally, urban, suburban, and rural areas. Note size, safety, and use. How might children's weight and motor skills be affected by the differences you observe?
2. Developmental psychologists believe that every teacher should be skilled at teaching children with a wide variety of needs. Does the teacher-training curriculum at your college or university reflect this goal? Should all teachers take the same courses, or should some teachers be specialized? Give reasons for your opinions.
3. Internet sources on any topic vary in quality. This is particularly true of websites designed for parents of children with special needs. Pick one childhood disability or disease and find several Web sources devoted to that condition. How might parents evaluate the information provided?
4. Special education teachers are in great demand. In your local public school, what is the ratio of regular to special education teachers? How many of those special education teachers are in self-contained classrooms, resource rooms, and inclusion classrooms? What do your data reveal about the education of children with special needs in your community?



CHAPTER 12

Middle Childhood: Cognitive Development



What Will You Know?

1. Does cognition improve naturally with age, or is teaching crucial to its development?
2. Why do children use slang, curse words, and bad grammar?
3. What type of school is best during middle childhood?

- Building on Theory
  - Piaget and School-Age Children
  - Vygotsky and School-Age Children
  - Information Processing
- Language
  - Vocabulary
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- Teaching and Learning
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  - Choices and Complications

At age 9, I wanted a puppy. My parents said no; we already had Dusty, our family dog. I dashed off a poem, promising "to brush his hair as smooth as silk" and "to feed him milk." Twice wrong. Not only poor cadence, but also, puppies get sick on cow's milk. But my father praised my poem; I got Taffy, a blonde cocker spaniel.

At age 10, my daughter Sarah wanted her ears pierced. I said no, it would be unfair to her three older sisters, who had had to wait for ear piercing until they were teenagers. Sarah wrote an affidavit and persuaded all three to sign "No objection." She got gold posts.

Our wishes differed by cohort and our strategies by family. Sarah knew I wouldn't budge for doggerel but that signed documents might work. In the end, we were both typical school-age children, mastering whatever circumstances offer, wanting something that we did not need. Depending on the context, children learn to divide fractions, text friends, memorize baseball stats, load rifles, and persuade parents.

This chapter describes the cognitive accomplishments that make all that possible. We begin with Piaget, Vygotsky, and information processing. Then we discuss applications of those theories to language and formal education, nationally and internationally. Everyone agrees that extensive learning occurs; adults disagree sharply about how best to teach.

concrete operational thought
Piaget's term for the ability to reason logically about direct experiences and perceptions.



Product of Cognition Concrete thinking is specific, such as caring for a lamb until it becomes an award-winning sheep, as this New Jersey 4-H member did

Building on Theory

Learning is rapid. By age 11, some children beat their elders at chess, play music that adults pay to hear, publish poems, or win trophies for spelling or sports or some other learned skill. Others survive on the streets or kill in wars, mastering lessons that no child should have to study. How do they learn so quickly?

Piaget and School-Age Children

Piaget called the cognition of middle childhood **concrete operational thought,** characterized by new concepts that enable children to use logic. *Operational* comes

[illegible] preoperational [illegible] logic. [illegible] By calling this period [illegible] emphasis on positive abilities.

The [illegible] and [illegible] limited by egocentrism, errors in logical operations. Children apply their new reasoning skills to concrete situations, which are situations grounded in actual experience, like the concepts of a report's sidewalk. Concrete thinking arises from what is visible, tangible, and real. Less abstract and [illegible] is in the [illegible] formal operational thought. A shift from preoperational to concrete operational thinking occurs between ages 5 and 7. Children become more systematic, objective, scientific, and efficient.

A Hierarchy of Categories

One logical operation is **classification,** the organization of things into groups (or *categories* or *classes*) according to some characteristic that they share. For example, *family* includes parents, siblings, and cousins. Other common classes are animals, toys, and food. Each class includes some elements and excludes others; each is part of a hierarchy.

classification The concept that things can be organized into groups or classes (sometimes called categories) according to characteristics they have in common.

Food, for instance, is an overarching category, with the next lower level of the hierarchy being meat, grains, fruits, and so on. Most subclasses can be further divided. Meat includes poultry, beef, and pork, each of which can be divided again. Adults realize that items at the bottom of a classification hierarchy belong to every higher level: Bacon is always pork, meat, and food, but most food, meat, and pork are not bacon. However, the mental operation of moving up and down the hierarchy is beyond preoperational children.

Piaget devised many classification experiments. For example, a child is shown a bunch of nine flowers—seven yellow daisies and two white roses. Then the child is asked, "Are there more daisies or more flowers?"

Until about age 7, most children answer, "More daisies." The youngest children offer no justification, but some 6-year-olds explain that "there are more yellow ones than white ones" or "because daisies are daisies, they aren't flowers" (Piaget et al., 2001). By age 8, most children can classify. "More flowers than daisies," they say.

Other Logical Concepts

Several logical concepts were already discussed in Chapter 9—in the explanation of ideas that are beyond preoperational children, such as conservation and [illegible].

Another example of concrete logic is **seriation,** the knowledge that things can be arranged in a logical *series*. Seriation is crucial for using—not merely memorizing—the alphabet or the number sequence. By age 5, most children can count up to 100, but because they do not yet grasp seriation, they cannot correctly estimate where any particular two-digit number would be placed on a line that starts at zero and ends at 100 (Meadows, 2006).

seriation The concept that things can be arranged in a logical series, such as the number sequence or the alphabet.

Math and Money This 6th-grader, Perry Akootchook, understands basic math, so he might beat his mother at "spinning for money," shown here. Compare his concrete operational skills with that of a typical preoperational child, who would be delighted to play this game and might give a dime for a nickel.



Concrete operational thought correlates with primary school math achievement, although many other factors contribute (De Smedt et al., 2009). For example, logic helps with [illegible]. Children at the stage of concrete operational thought eventually understand that $12 + 3 = 3 + 12$ and that 15 is always 15 (conservation), that all the numbers from 20 to 29 are in the 20s (classification), that 134 is less than 143 (seriation), and that if $5 \times 3 = 15$, then $15 \div 5$ is 3 (reversibility). **Developmental Link:** These concepts are explained in Chapter 9 and detailed in a recently reissued classic, Inhelder & Piaget, 1964/2013.

The Significance of Piaget's Findings

Logic connects to math ability, as just shown. However, researchers find more continuity than discontinuity as children master number skills. Thus, Piaget's stage idea was mistaken: There is no sudden shift in logic between preoperational and concrete operational intelligence.

Nonetheless, Piaget's experiments revealed something important. School-age children can use mental categories and subcategories more flexibly, inductively and simultaneously than younger children can. They are cognitively advanced, capable of thinking in ways that younger children are not.

LaunchPad

Video Activity: The Balance Scale
Task shows children of various ages completing the task and gives you an opportunity to try it, too.

Vygotsky and School-Age Children

Like Piaget, Vygotsky felt that educators should consider children's thought processes, not just the outcomes. He appreciated the fact that children are curious, creative learners. For that reason, Vygotsky believed that an educational system based on rote memorization rendered the child "helpless in the face of any sensible attempt to apply any of this acquired knowledge" (Vygotsky, 1994a pp. 356–357).

The Role of Instruction

Unlike Piaget, Vygotsky stressed the centrality of instruction. Vygotsky believed school could be crucial for cognitive growth. He thought that peers and teachers provide the bridge between developmental potential and needed skills via guided participation and scaffolding, in the zone of proximal development. (**Developmental Link:** Vygotsky's theory is discussed in Chapters 2 and 9.)

Especially for Teachers How might Piaget's and Vygotsky's ideas help in teaching geography to a class of [illegible]? (See response on page 381.)

Confirmation of the role of social interaction and instruction comes from a U.S. study of children who, because of their school's entry-date cutoff, are either relatively old kindergartners or quite young first-graders. At the end of the school year, achievement scores of the 6-year-old first-graders far exceeded those of kindergarten 6-year-olds who were only one month younger (Lincove & Painter, 2006). Obviously, they had learned a great deal from their year of first grade instruction.

Internationally as well, children who begin first grade earlier tend to be ahead in academic achievement compared to those who enter later, an effect noted even at age 15. The author of this study noted that Vygotsky's theory is not the only one that explains this finding and that these results were not found in every nation (Sprietsma, 2010). However, no matter what explanation is correct, children's academic achievement seems influenced by social context.

Girls Can't Do It As Vygotsky reasoned, children learn whatever their culture teaches. Fifty years ago girls were in cooking and sewing classes. No longer. This 2012 photo shows 10-year-olds Kamrin and Caitlin in a Kentucky school, preparing for a future quite different from that of their grandmothers.



Vygotsky would certainly agree with that, and he would explain those national differences by noting that education before first grade in some nations is far better than in others. Remember that Vygotsky believed education occurs everywhere, not only in school. Children learn as they play with peers, watch television, eat with their families, walk down the street. Every experience, from birth on, teaches them something, with some contexts much more educational than others.

For instance, a study of the reading and math achievement of more than one thousand third- and fifth-grade children from ten U.S. cities found that high-scoring primary school children were likely to have had extensive cognitive stimulation. There were three main sources of intellectual activity

1. Families (e.g., parents read to them daily when they were toddlers)
2. Preschool programs (e.g., a variety of learning activities)
3. First-grade curriculum (e.g., emphasis on literacy, with individualized evaluation and instruction)

In this study, most children from families of low socioeconomic status did not experience all three sources of stimulation, but those who did showed more cognitive advances by fifth grade than the average high-SES child (Crosnoe et al., 2010).

Generally, poverty reduces children's achievement because they are less likely to have these three sources of stimulation. However, for low-SES children especially, maternal education makes a notable difference in academic achievement—presumably because educated mothers read, listen, and talk to their children more. Also, an educated mother is more likely to place her child in a preschool with a curriculum that encourages learning.

International Contexts

Vygotsky's emphasis on sociocultural contexts contrasts with Piaget's maturational, self-discovery approach. Vygotsky believed that cultures (tools, customs, and mentors) are powerful educators. For example, if a child is surrounded by reading adults, by full bookcases, by daily newspapers, and by street signs, that child will read better than a child who has had little exposure to print, even if both are in the same classroom.

The same applies to math. If children learn math in school, they are proficient at school math; if they learn math out of school, they are adept at solving mathematical problems in situations similar to the context in which they learned (Abreu, 2008). Ideally, though, children learn math both in and out of school.

Context affects more than academic learning. A stunning example of knowledge acquired from the social context comes from Varanasi, a city in northeast India. Many Varanasi children have an extraordinary sense of spatial orientation: They know whether they are facing north or south, even when they are inside a room with no windows. In one experiment, children were blindfolded, spun around, and led to a second room, yet many still knew which way they were now facing (Mishra et al., 2009). How did they know? Perhaps social context.

In Varanasi, everyone refers to the spatial orientation to locate objects. (The English equivalent might be, not that the dog is sleeping by the door, but that the dog is sleeping southeast.) From their early days, children learn north/south/east west in order to communicate. By middle childhood, they have an internal sense of direction.

Culture affects how children learn, not just what they learn. This was evident in a two-session study in California of 80 Mexican American children, each with a sibling (Silva et al., 2010). Half of the sibling pairs were from indigenous Mexican families, in which children learn by watching, guided by other children. The other half were from families acculturated to U.S. learning, via direct instruction, not observation. Those acculturated children had learned to work independently, sitting at desks, not collaboratively, crowding around a teacher.

In the first session of this study, a Spanish-speaking "toy lady" showed each child how to make a toy while his or her sibling sat nearby. First, the younger sibling waited while the older sibling made a toy mouse, and then the older sibling waited while the younger sibling made a toy frog. Each waiting child's behavior was videotaped and coded every 5 seconds as *sustained attention* (alert and focused on the activity), *glancing* (sporadic interest, but primary focus elsewhere), or *not attending* (looking away).

A week later, each child individually was told there was some extra material to make the toy that his or her sibling had made the week before, and was encouraged to make



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Never Lost These children of Varanasi sleep beside the Ganges in the daytime. At night they use their excellent sense of direction to guide devotees from elsewhere.

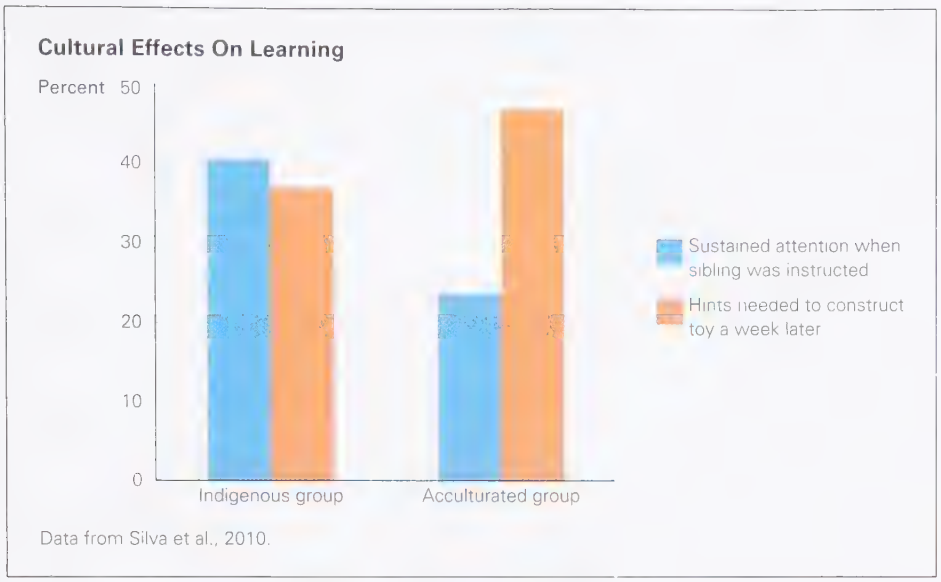


FIGURE 12.1
Two Ways to Learn Even when children currently live in the same settings and attend the same schools, they follow family cultural traditions in the way they learn.

the mouse or the frog (whichever one that child had not already made). In this second session, the toy lady did not give the children step-by-step instructions as she had for the sibling a week earlier, but she had a long list of hints she could give *if* the child needed them.

The purpose of this experiment was to see how much the children had learned by observation the week before. The children from indigenous backgrounds scored higher, needing fewer hints, because they had been more attentive when their siblings made the toy (Silva et al., 2010) (see Figure 12.1).

The same conclusions have been found in other research. For example, in another study, children born and raised in the United States who are accustomed to learning by observation (as in some Native American cultures) were more proficient at remembering an overheard folktale (Tsethlikai & Rogoff, 2013).

Information Processing

Today's educators and psychologists regard both Piaget and Vygotsky as insightful. International research confirms the merits of their theories. Piaget described universal changes; Vygotsky noted cultural impact.

A third approach to understanding cognition adds crucial insight. The *information-processing perspective* benefits from technology that allows much more detailed data and analysis than was possible for Piaget or Vygotsky. (**Developmental Link:** Information processing is introduced in Chapter 2.)

Thousands of researchers who study cognition can be said to use the information-processing approach. Not all of them would describe themselves as doing so because "information processing is not a single theory but, rather, a framework characterizing a large number of research programs" (Miller, 2011, p. 266).

The basic assumption of all such research programs is that, like computers, people can access large amounts of information. They then: (1) seek relevant units of information (as a search engine does), (2) analyze (as software programs do), and (3) express their conclusions so that another person can understand (as a networked computer or a printout might do). By tracing the paths and links of each of these functions, scientists better understand the learning process.

The brain's gradual growth, now seen in neurological scans, confirms the usefulness of the information-processing perspective. So does data on children's

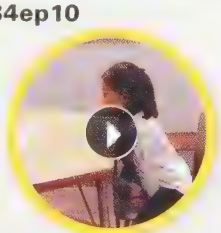
Response for Teachers (from page 379): Here are two of the most obvious ways. (1) Use logic. Once children can grasp classification and class inclusion, they can understand cities within states, states within nations, and nations within continents. Organize your instruction to make logical categorization easier. (2) Make use of children's need for concrete and personal involvement. You might have the children learn first about their own location, then about the places where relatives and friends live, and finally about places beyond their personal experience (via books, photographs, videos, and guest speakers).



JANE SWEENEY (LONELY PLANET IMAGE LIBRARY)

Skills of the Street Children In many nations, children sell to visitors, using math and business skills that few North American children know. This boy was offering necklaces to visitors at the Blue Mosque in Afghanistan.

Arithmetic Strategies: The Research of Robert Siegler
http://qrs.ly/o84ep10



VIDEO BY GEETHA RAMANI AND ROBERT SIEGLER, CARNEGIE MELLON UNIVERSITY

school achievement: Absences, vacations, new schools, and even new teachers may set back a child's learning because learning each day builds on the learning of the previous day. Brain connections and pathways are forged from repeated experiences, allowing advances in processing. Without careful building and repetition of various skills, fragile connections between neurons break.

One of the leaders of the information-processing perspective is Robert Siegler. He has studied the day-by-day details of children's cognition in math (Siegler & Chen, 2008).

Apparently, children do not suddenly grasp the logic of the number system, as Piaget expected at the concrete operational stage. Instead, number understanding accrues gradually, with new and better strategies for calculation tried, ignored, half-used, abandoned, and finally adopted. Siegler compared the acquisition of knowledge to waves on an ocean beach when the tide is rising. There is substantial ebb and flow, although eventually a new level is reached.

One example is the ability to estimate where a number might fall on a line, such as where the number 53 would be placed on a line from zero to 100. This skill predicts later math achievement (Libertus et al., 2013). U.S. kindergartners are usually lost when asked to do this task; Chinese kindergartners are somewhat better (Siegler & Mu, 2008).

Everywhere, proficiency gradually builds from the first grade on, predicting later math skills (Feigenson et al., 2013). This has led many information-processing experts to advocate giving children practice with number lines in order to develop math ability, such as the ability to do multiplication and division.

Curiously, knowing how to count to high numbers seems less important for math mastery than being able to estimate magnitude (Thompson & Siegler, 2010). For example, understanding the size of fractions (e.g., that 3/16 is smaller than 1/4) is connected to a thorough grasp of the relationship between one number and another, a skill that predicts later math achievement internationally, according to a study of school children in China, Belgium, and the United States (Torbeyns et al., 2014). Overall, information processing guides teachers who want to know exactly which concepts and skills are crucial foundations for mastery, not only for math but for reading and writing as well.

Memory

Many scientists who study memory take an information-processing approach. They have learned that various methods of input, storage, and retrieval affect the increasing cognitive ability of the schoolchild. Each of the three major steps in the memory process—sensory memory, working memory, and long-term memory—is affected by both maturation and experience.

sensory memory The component of the information-processing system in which incoming stimulus information is stored for a split second to allow it to be processed. (Also called the *sensory register.*)

working memory The component of the information-processing system in which current conscious mental activity occurs. (Formerly called *short-term memory.*)

Sensory memory (also called the *sensory register*) is the first component of the human information-processing system. It stores incoming stimuli for a split second, with sounds retained slightly longer than sights. To use terms explained in Chapter 5, *sensations* are retained for a moment, and then some become *perceptions*. This first step of sensory awareness is already quite good in early childhood. Sensory memory improves slightly until about age 10 and remains adequate until late adulthood.

Once some sensations become perceptions, the brain selects the meaningful ones and transfers them to working memory for further analysis. It is in **working memory** (formerly called *short-term memory*) that current, conscious mental activity occurs. Processing, not mere exposure, is essential for getting information into working memory; for this reason, working memory improves markedly in middle childhood (Cowan & Alloway, 2009) (see Table 12.1).



TABLE 9.1 Advances in Memory from Infancy to Age 11

Child's Age	Memory Capabilities
Under 2 years	Infants remember actions and routines that involve them. Memory is implicit, triggered by sights and sounds (an interactive toy, a caregiver's voice).
2–5 years	Words are now used to encode and retrieve memories. Explicit memory begins, although children do not yet use memory strategies. Children remember things by rote (their phone number, nursery rhymes).
5–7 years	Children realize they need to remember some things, and they try to do so, usually via rehearsal (repeating an item again and again). This is not the most efficient strategy, but repetition can lead to automatization.
7–9 years	Children can learn new strategies, including visual clues (remembering how a particular spelling word looks) and auditory hints (rhymes, letters), evidence of brain functions called the visual-spatial sketchpad and phonological loop. Children benefit from organizing things to be remembered.
9–11 years	Memory becomes more adaptive and strategic as children become able to learn various memory techniques from teachers and other children. They can organize material themselves, developing their own memory aids.

Source: Based on Meadows, 2006

As Siegler's waves metaphor suggests, memory strategies for processing information do not appear suddenly. Gradual improvement occurs from toddlerhood through adolescence (Schneider & Lockl, 2008). Children develop strategies to increase working memory (Camos & Barrouillet, 2011), and they use these strategies occasionally at first, then consistently.

Cultural differences are evident. For example, many Muslim children are taught to memorize all 80,000 words of the Quran, so they learn strategies to remember long passages. These strategies are unknown to non-Muslim children, and they help with other cognitive tasks (Hein et al., 2014). A very different example is the ability to draw a face, an ability admired by U.S. children. They learn strategies to improve their drawing, such as knowing where to put the eyes, mouth, and chin when drawing a face. (Few spontaneously draw the eyes mid-face, rather than at the top, but most learn to do so.)

Finally, information from working memory may be transferred to **long-term memory,** to be stored for minutes, hours, days, months, or years. The capacity of long-term memory—how much can be crammed into one brain—is huge by the end of middle childhood. Together with sensory memory and working memory, long-term memory organizes ideas and reactions, fostering more effective learning over the years (Wendelken et al., 2011).

long-term memory The component of the information-processing system in which virtually limitless amounts of information can be stored indefinitely.

Crucial to long-term memory is not merely *storage* (how much material has been deposited) but also *retrieval* (how readily past learning can be brought into working memory). For everyone at every age, retrieval is easier for some memories (especially of vivid, emotional experiences) than for others. And for everyone, long-term memory is imperfect: We all forget and distort memories, with strategies needed for accurate recall.

Especially for Teachers How might your understanding of memory help you teach a 2,000-word vocabulary list to a class of fourth-graders? (see response, page 385)

Knowledge

Research on information processing finds that the more people already know, the more information they can learn. Having an extensive **knowledge base,** or a broad body of knowledge in a particular subject, makes it easier to remember and understand related new information. As children gain knowledge during the

knowledge base A body of knowledge in a particular area that makes it easier to master new information in that area.



MICHAEL PRINCE/CORBIS

What Does She See? It depends on her knowledge base and personal experiences. Perhaps this trip to an aquarium in North Carolina is no more than a break from the school routine, with the teachers merely shepherding the children to keep them safe. Or, perhaps she has learned about sharks and dorsal fins, about scales and gills, about warm-blooded mammals and cold-blooded fish, so she is fascinated by the swimming creatures she watches. Or, if her personal emotions shape her perceptions, she feels sad about the fish in their watery cage or finds joy in their serenity and beauty.

control processes Mechanisms (including selective attention, metacognition, and emotional regulation) that combine memory, processing speed, and knowledge to regulate the analysis flow of information within the information-processing system. (Also called *executive processes*.)

metacognition "Thinking about thinking," or the ability to evaluate a cognitive task in order to determine how best to accomplish it, and then to monitor and adjust one's performance on that task.

executive function The cognitive ability to organize and prioritize the many thoughts that arise from the various parts of the brain, allowing the person to anticipate, strategize, and plan behavior.

school years, they become better able to judge what is true or false, what is worth remembering, and what is insignificant (Woolley & Ghossainy, 2013).

Three factors facilitate increases in the knowledge base: past experience, current opportunity, and personal motivation. The last item in this list explains why children's knowledge base is not what their parents or teachers might prefer. Some schoolchildren memorize words and rhythms of hit songs, know plots and characters of television programs, or can recite the names and histories of basketball players, and yet they do not know whether World War I was in the nineteenth or twentieth century or whether Pakistan is in Asia or Africa.

Motivation provides a clue for teachers: New concepts are learned best if they are connected to personal and emotional experiences. Children who themselves are from South Asia, or who have classmates who are, learn the boundaries of Pakistan more readily.

Control Processes

The mechanisms that put memory, processing speed, and the knowledge base together are **control processes;** they regulate the analysis and flow of information within the system. Control processes include *emotional regulation* and *selective attention* (explained in Chapters 10 and 11, respectively).

Equally important is **metacognition,** sometimes defined as "thinking about thinking," understanding how to learn. Metacognition is the ultimate control process because it allows a person to evaluate a cognitive task, determine how to accomplish it, monitor performance, and then make adjustments. According to scholars of cognition, "Middle childhood may be crucial for the development of metacognitive monitoring and study of control processes" (Metcalfe & Finn, 2013, p. 19).

Control processes require the brain to organize, prioritize, and direct mental operations, much as the CEO (chief executive officer) of a business organizes, prioritizes, and directs business operations. For that reason, control processes are also called *executive processes*, and the ability to use them is called **executive function** (already mentioned in Chapter 9), which allows a person to step back from the specifics of learning and thinking and consider more general goals and strategies. Executive function is evident whenever people concentrate on the relevant parts of a task, using the knowledge base to comprehend new information and apply memory strategies.

Executive function ability is a foundation for learning in early and middle childhood, measurable already by age 5, and more evident among 10-year-olds than among 4- or 6-year-olds (Masten, 2014; Bjorklund et al., 2009). For example, fourth-grade students can listen to the teacher talk about the river Nile, ignoring classmates who are chewing gum or passing notes.

Deliberate selectivity is a control process at work. A child can decide to do homework before watching television or to review spelling words before breakfast, creating mnemonics to remember the tricky parts. All these signify executive function.

Both metacognition and control processes improve with age and experience. For instance, in one study, children took a fill-in-the-blanks test and indicated how confident they were of each answer. Then they were allowed to delete some questions, with the remaining ones counting more. Already by age 9, they were able to estimate correctness; by age 11, they were skilled at knowing what to delete (Roebers et al., 2009).

Sometimes, experience that is not directly related has an impact. This seems to be true for fluently bilingual children, who must learn to inhibit one language while using another. They are advanced in control processes, obviously in language but also in more abstract measures of control (Bialystok, 2010).



Control processes develop spontaneously as the prefrontal cortex matures, but they can also be taught. Sometimes teaching is explicit, more so in some nations (e.g., Germany) than in others (e.g., the United States) (Bjorklund et al., 2009). Examples that may be familiar include spelling rules ("*i* before *e* except after *c*") and ways to remember how to turn a light bulb (lefty-loosey, righty-tighty). Preschoolers ignore such rules or use them only on command; 7-year-olds begin to use them; 9-year-olds can create and master more complicated rules.

Many factors beyond specific instruction affect learning. For example, if children do not master emotional control in early childhood, their school achievement is likely to suffer for years (Bornstein et al., 2013).

Given the complexity of factors and goals, educators disagree as to what should be deliberately taught versus what is best discovered by the child. However, understanding the early steps that lead to later knowledge, as information processing seeks to do, may guide instruction and hence improve learning. Exactly how to do that is an important topic of current research, as you will see in A View from Science on page 391. But first, consider one specific domain of learning that advances during middle childhood, language.

SUMMING UP Every theory of cognitive development recognizes that school-age children are avid learners who actively build on the knowledge they already have. Piaget emphasized that children's own grasp of logic, via maturation and experience, allows them to reach the cognitive stage he called concrete operational thought. Then they can apply that logic to learning math and many other academic tasks. Research inspired by Vygotsky and the sociocultural perspective reveals that cultural differences can be powerful: Both what is learned and how it is learned are influenced by the context of instruction and everyday experience. Because cultures vary, children also vary in what they learn and how they learn it.

An information-processing analysis highlights the many components of thinking that advance, step-by-step, during middle childhood. Although sensory and long-term memory do not change much during these years, the speed and efficiency of working memory improve dramatically, making school-age children better thinkers as well as more strategic learners as they grow older. With every passing year children expand their knowledge base, which makes new material easier to connect with past learning and thus easier to learn. As control processes and metacognition advance, children are better able to direct their minds toward whatever they want to learn. Executive function is crucial, as children who are more capable with executive processes are also better able to learn.

WHAT HAVE YOU LEARNED?

1. Why did Piaget call cognition in middle childhood *concrete operational thought?*
2. How would one express classification in a category other than those listed in the text, such as transportation or plants?
3. How do Vygotsky and Piaget differ in their explanation of cognitive advances in middle childhood?
4. How are the children of Varanasi an example of Vygotsky's theory?
5. How does information-processing theory differ from traditional theories of cognitive development?
6. According to Siegler, what is the pattern of learning math concepts?
7. What aspects of memory improve markedly during middle childhood?
8. How and why does the knowledge base increase in middle childhood?
9. How might executive function help a student learn?

Response for Teachers (from page 383): Children this age can be taught strategies for remembering by forming links between working memory and long-term memory. You might break down the vocabulary list into word clusters, grouped according to root words, connections to the children's existing knowledge, applications, or (as a last resort) first letters or rhymes. Active, social learning is useful; perhaps in groups, the students could write a story each day that incorporates 15 new words. Each group could read its story aloud to the class.

Language

As you will remember, many aspects of language advance during early childhood. By age 6, children have mastered the basic vocabulary and grammar of their first language. Many also speak a second language fluently. Those linguistic abilities allow the formation of a strong knowledge base, enabling some school-age children to learn up to 20 new words a day and to apply complex grammar rules. Here are some specifics.

Vocabulary

By age 6, children know the names of thousands of objects, and they use many parts of speech—adjectives and adverbs as well as nouns and verbs. As Piaget stressed, their thinking soon becomes more flexible and logical; they can understand prefixes, suffixes, compound words, phrases, and metaphors. For example, 2-year-olds know *egg*, but 10-year-olds also know *egg salad*, *egg-drop soup*, *egghead*, and *last one in is a rotten egg*. They know that each of these expressions is distinct from the uncooked eggs in the refrigerator.

Understanding Metaphors

Metaphors, jokes, and puns are finally comprehended. Some jokes ("What is black and white and read all over?" "Why did the chicken cross the road?") are funny only during middle childhood. Younger children don't understand why they provoke laughter, and teenagers find them lame and stale, but the new cognitive flexibility of 6- to 11-year-olds allows them to enjoy puns, unexpected answers to normal questions, as well as metaphors and similes.

Indeed, a lack of metaphorical understanding, even if a child has a large vocabulary, signifies cognitive problems (Thomas et al., 2010). Humor, or lack of it, is a diagnostic tool.

Many adults do not realize how difficult it is for young children or adults who are learning a new language to grasp figures of speech. The humorist James Thurber remembered what he called "the enchanted private world" of his early boyhood:

> In this world, businessmen who phoned their wives to say they were tied up at the office sat roped to their swivel chairs, and probably gagged, unable to move or speak except somehow, miraculously, to telephone. . . . Then there was the man who left town under a cloud. Sometimes I saw him all wrapped up in the cloud and invisible. . . . At other times it floated, about the size of a sofa, above him wherever he went. . . . [I remember] the old lady who was always up in the air, the husband who did not seem able to put his foot down, the man who lost his head during a fire but was still able to run out of the house yelling.
>
> *[Thurber, 1999, p. 40]*

Metaphors are context-specific, building on the knowledge base. An American who lives in China notes phrases that U.S. children learn but that children in cultures without baseball do not, including "dropped the ball," "on the ball," "play ball," "throw a curve," "strike out" (Davis, 1999). If a teacher says "keep your eyes on the ball," some immigrant children might not pay attention because they are looking for that ball.

Because school-age children can create metaphors and similes, asking them to do so reveals emotions that they do not express in other ways. For instance, in a study of how children felt about their asthma, one 11-year-old said that his asthma

> is like a jellyfish, which has a deadly sting and vicious bite and tentacles which could squeeze your throat and make your bronchioles get smaller and make breathing harder. Or like a boa constrictor squeezing life out of you.
>
> *[quoted in Peterson & Sterling, 2009, p. 97]*

Especially for Parents You've had an exhausting day but are setting out to buy groceries. Your 7-year-old son wants to go with you. Should you explain that you are so tired that you want to make a quick solo trip to the supermarket this time? (see response, page 388)

That boy was terrified of his disease, which he considered evil and dangerous —and beyond his parents' help. Other children in the same study responded differently. One girl thought asthma would attack her only if she was not good and that her "guardian angel" would keep it away as long as she behaved herself. Adults who want to know how a child feels about something might ask for a metaphor.

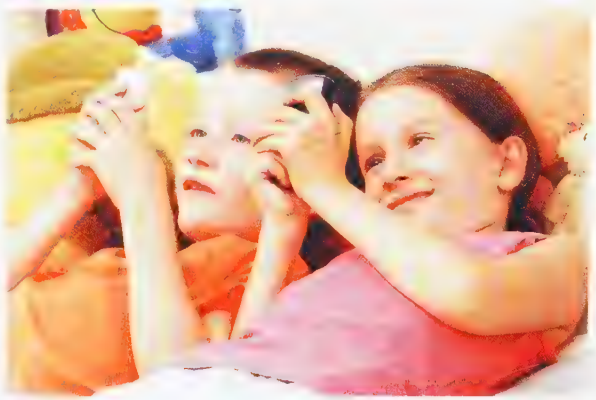
Adjusting Vocabulary to the Context

One aspect of language that advances markedly in middle childhood is pragmatics, already defined in Chapter 9. Pragmatics is evident in the contrast between talking formally to teachers (never calling them a *rotten egg*) and informally with friends (who can be rotten eggs or worse). As children master pragmatics, they become more adept at making friends. Shy 6-year-olds cope far better with the social pressures of school if they use pragmatics well (Coplan & Weeks, 2009). By contrast, children with autism who have learned to talk are usually very poor at pragmatics (Klinger et al., 2014).

Mastery of pragmatics allows children to change styles of speech, or "linguistic codes," depending on their audience. Each code includes many aspects of language—tone, pronunciation, gestures, sentence length, idioms, vocabulary, and grammar. Sometimes the switch is between *formal code* (used in academic contexts) and *informal code* (used with friends); sometimes it is between standard (or proper) speech and dialect or vernacular (used on the street). Code used in texting—numbers (411), abbreviations (LOL), emoticons (:-D), and spelling (r u ok?)—shows exemplary pragmatics.

Some children may not realize that informal expressions are wrong in formal language. All children need instruction to become fluent in the formal code because the logic of grammar (whether *who* or *whom* is correct or how to spell *you*) is almost impossible to deduce. The peer group teaches the informal code, and each local community transmits dialect, metaphors, and pronunciation.

Educators must teach the formal code. However, they should not make children feel that their neighborhood or family grammar or pronunciation is shameful.


BSIP PHOTO RESEARCHERS, INC

Typical Yet Unusual It's not unusual that these children are texting in French; they live in Bordeaux, and children everywhere text their friends. The oddity is that a girl and a boy are lying head to head, which rarely occurs in middle childhood. The explanation? They are siblings. Like dogs and cats that grow up together, familiarity overtakes hostility.

Bilingual Education

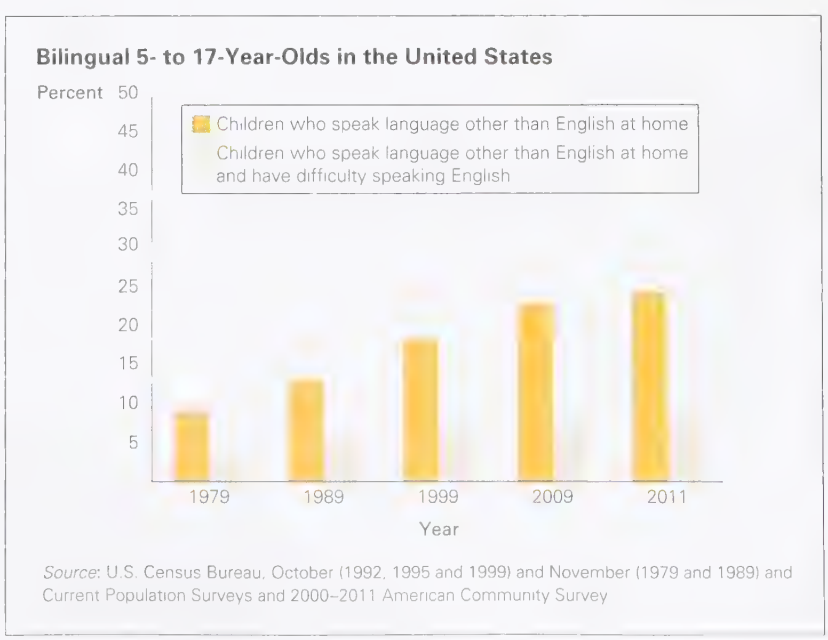
Code changes are obvious when children speak one language at home and another at school. Every nation includes many such children; most of the world's 6,000 languages are not school languages. For instance, English is the language of instruction in Australia, but 17 percent of the children speak one of 246 other languages at home (Centre for Community Child Health & Telethon Institute for Child Health Research, 2009).

In the United States, almost 1 school-age child in 4 speaks a language other than English at home. Most of them also speak English well, according to their parents (see Figure 12.2).

In addition, many other children speak a dialect of English that differs from the pronunciation and grammar taught at school. All these alternate codes have distinct patterns of timing, grammar, and emphasis, as well as vocabulary, so all require much more than literal translation.

FIGURE 12.2

Hurray for Teachers More children in the United States are now bilingual and more of them speak English well, from about 60 percent in 1980 to 75 percent in 2011.



Source: U.S. Census Bureau, October (1992, 1995 and 1999) and November (1979 and 1989) and Current Population Surveys and 2000–2011 American Community Survey

If a child learns only one language in the early years, but then masters a second language during middle childhood, the brain must adjust. A study found no brain differences between monolingual and bilingual children if they spoke both languages from infancy. However, from about age 4 through adolescence, the older children are when they learn a second language, the more likely their brains will reveal differences that result from the need to accommodate their dual languages.

Specifically, children who learn a second language later have greater cortical thickness on the left side (the language side) and thinness on the right (Klein et al., 2014). This reflects what we know about language learning: School-age children can master a second language they did not know before, but they must work at it.

In the United States, some children of every ethnicity are called **ELLs,** or **English Language Learners,** based on their proficiency in speaking, writing, and reading English. Among U.S. children with Latin American heritage, those who speak English well are much better at reading than those who do not. Age, schooling, and SES all have an effect, but even some of higher SES may be less adept at reading than the average European American child (Howard et al., 2014). Culture may be the reason, as their learning style may not be the same as their teachers' teaching style, even though they speak and understand English well.

ELLs (English Language Learners) Children in the United States whose proficiency in English is low—usually below a cutoff score on an oral or written test. Many children who speak a non-English language at home are also capable in English; they are *not* ELLs.

immersion A strategy in which instruction in all school subjects occurs in the second (usually the majority) language that a child is learning.

bilingual schooling A strategy in which school subjects are taught in both the learner's original language and the second (majority) language.

ESL (English as a Second Language) A U.S. approach to teaching English that gathers all the non-English speakers together and provides intense instruction in English. Their first language is never used; the goal is to prepare them for regular classes in English.

Teaching approaches range from **immersion,** in which instruction occurs entirely in the new language, to the opposite, in which children are taught in their first language until the second language can be taught as a "foreign" tongue (a strategy rare in the United States but common elsewhere). Between these extremes lies **bilingual schooling,** with instruction in two languages, and **ESL (English as a Second Language),** with all non-English speakers taught English in one multilingual group. ESL is intended to be a short and intense program to prepare students for regular classes.

Methods for teaching a second language sometimes succeed and sometimes fail, with the research not yet clear as to which approach is best (Gandara & Rumberger, 2009). The success of any method seems to depend on the literacy of the home environment (frequent reading, writing, and listening in any language helps); the warmth, training, and skill of the teacher; and the national context.

Specifics differ for each state and grade level, but the general trends are dismal. ELLs fall more behind their peers with each passing grade, becoming high school dropouts at higher rates than other students their age. For instance, in Pennsylvania in 2009, the percent of fourth graders proficient in reading was 74 percent for the non-ELLs but only 30 percent for the ELLs. The gap in math scores was not quite as wide, but in every subject and every grade, the gap widened as children grew older (O'Conner et al., 2012).

Using an information-processing perspective, scholars have discovered that each aspect of language learning follows a distinct developmental path, and this can help teachers target exactly the learning that each child needs. Between ages 5 and 8, for children who speak Spanish at home and English in school, the length of each sentence in English (average number of words) dips during summer vacation but fluency improves steadily (words per minute). Especially for them, the 3-month-long summer break is destructive of education (Rojas & Iglesias, 2013).

For these bilingual children, knowledge of Spanish follows another trajectory. It does not improve much during kindergarten and first grade (presumably because children focus on English), and then advances markedly at the end of second grade (Rojas & Iglesias, 2013). Schools can affect this by having Spanish classes for all the youngest children, so those whose home language is Spanish will appreciate their mother tongue. These are averages; specifics of learning and effective educational strategies depend on the particular experiences of the child at home and school, just as information-processing theory would predict.

✓. **Response for Parents** (from page 386): Your son would understand your explanation, but you should take him along if you can do so without losing patience. You wouldn't ignore his need for food or medicine, so don't ignore his need for learning. While shopping, you can teach vocabulary (does he know pimientos, pepperoni, polenta?), categories (root vegetables, freshwater fish), and math (which size box of cereal is cheaper?). Explain in advance that you need him to help you find items and carry them and that he can choose only one item that you wouldn't normally buy. Seven-year-olds can understand rules, and they enjoy being helpful.

Differences in Language Learning

Learning to speak, read, and write the school language is pivotal for primary school education. Some differences in ability may be innate: A child with a language disability will have trouble with both the school and home languages.

It is a mistake to assume that a child who does not speak English well is learning disabled (difference is not deficit), but it is also is a mistake to assume that such a child's only problem is lack of English knowledge (deficits do occur among all children, no matter what their background). To discover whether a child has difficulty learning language, it is best to test in the home language—even when the child has been speaking the second language from kindergarten on (Erdos et al., 2014).

Although some children from every language background have disabilities, most of the language gap between one child and another is the result of the social context, not brain abnormality. Two crucial factors are SES and expectations.

Socioeconomic Status

Decades of research throughout the world have found a strong correlation between academic achievement and socioeconomic status. Language is a major reason. Not only do children from low-SES families usually have smaller vocabularies than those from higher-SES families, but their grammar is also simpler (fewer compound sentences, dependent clauses, and conditional verbs), and their sentences are shorter (Hart & Risley, 1995; Hoff, 2013). That slows down school learning in every subject.

With regard to language learning, the information-processing perspective focuses on specifics that might affect the brain and thus the ability to learn. Brain scans confirm that development of the hippocampus is particularly affected by SES, as is language learning (Jednoróg et al., 2012). That is correlation; many researchers have sought the cause of the connection between SES and language. Possibilities abound—inadequate prenatal care, exposure to lead, no breakfast, overcrowded households, few books at home, teenage parents, authoritarian child rearing, inexperienced teachers, few neighborhood role models . . . the list could go on and on. All of these conditions correlate with low SES and less learning, but it is difficult to isolate the impact of any specific one.

However, one factor seems clearly a cause, not just a correlate, of language proficiency: language heard during the first five years of life. If it is extensive and elaborate, the child is likely to speak and then read well.

The mothers' education seems crucial. Many less-educated parents talk and listen much less to their infants and young children than college-educated parents do. For instance, among mothers of 2-year-olds, 24 percent of those with less than a high school education read books daily to their children, but 70 percent of the mothers with at least a BA do so (National Center for Education Statistics, 2009) (see Figure 12.3).

Even independent of income, research has shown that children who grow up in homes with many books accumulate, on average, three years more schooling than children who

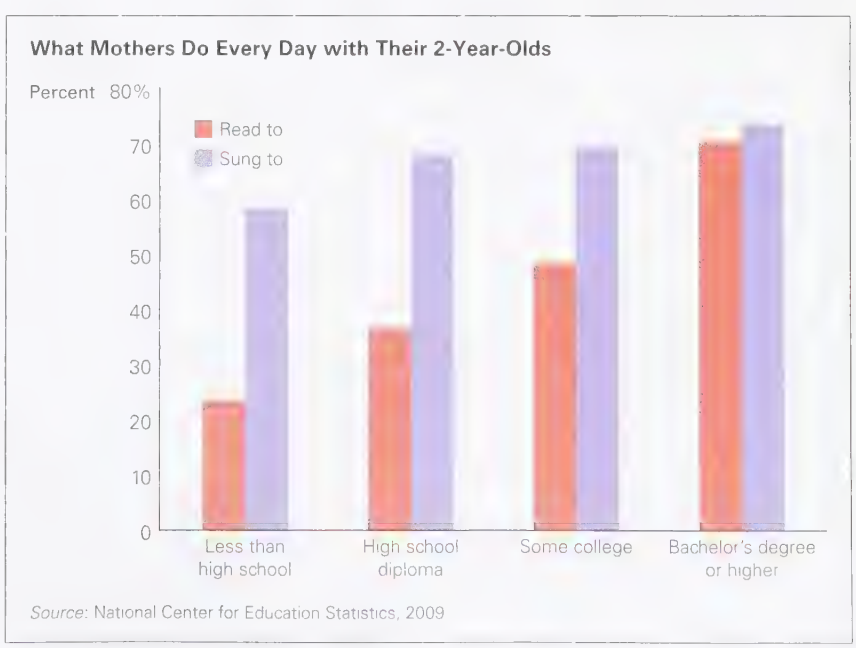


FIGURE 12.3
Red Fish, Blue Fish As you can see, most mothers sing to their little children, but the college-educated mothers are much more likely to know that book reading is important. Simply knowing how to turn a page or hearing new word combinations (hop on pop?) correlates with reading ability later on.



Priorities This family in London is low-income, evident in the stained walls, peeling paint, and old toilet, but that does not necessarily limit the girl's future. More important is what she learns about values and behavior. If this scene is typical, this mother is teaching her daughter about appearance and obedience. What would happen if the child had to care for her own grooming? Tangles? Short hair? Independence? Linguistic advances?

OBSERVATION QUIZ What in the daughter's behavior suggests that maternal grooming is a common event in her life? (see answer, page 392)

grow up in homes with no books (Evans et al., 2010), presumably because the parents of the latter group rarely read. Language exposure is the direct cause here, not household income. Indeed, children from high-SES families who rarely hear language also do poorly in school, and some low-SES families encourage language and their children do well.

Book-reading is not the only way to increase language learning in children (some families rarely read to their children but engage them in conversation about the interesting sights around them), but book-reading often indicates how much verbal input a child receives. Another way to surround children with language is to sing to a child, not just a few simple songs, but dozens of songs, with varied vocabulary in many stanzas.

Ideally, parents read to, sing to, and converse with each child daily, and also provide extensive vocabulary about various activities. For example, as parent and child are walking down the street: "The sidewalk is narrow (or wide, or cracked, or cement) here." "See the wilted rose. Is it red or magenta or maroon?" "That truck has six huge tires. Why does it have so many?" Children offer comments of their own, and adults can respond with "Yes," "That's interesting," "I never thought of that"—never ignoring the child or commanding, "Be quiet!"

Expectations

Beyond direct language encouragement, a second cause of low achievement in middle childhood is teachers' and parents' expectations. Although substantial research has found that children are influenced by adults' positive expectations, the relationship between expectation and achievement becomes complicated as children grow older. One crucial factor seems to be whether parents and teachers have shared expectations for the children, rather than working at cross-purposes. Also important is that children internalize those expectations rather than feel the need to rebel against them (Froiland & Davison, 2014).

Expectations need to be explicit, not idealistic. For instance, children should know that they are expected to read for pleasure rather than watch television, to learn advanced academic vocabulary (e.g., *negotiate*, *evolve*, *allegation*, *deficit*), and to have important ideas that the parent will listen to attentively and with respect. Remember, though, that authoritarian parenting, which includes high standards, can backfire if it is not accompanied by warmth.

Expectations do not necessarily follow along income lines, especially among immigrant families. For low-SES Latinos especially, family expectations for learning are often high. Their children try to meet those expectations because they want to validate their parents' decision to leave their native land to improve life for their children (Ceballo et al., 2014; Fuller & García Coll, 2010).

The worst result of low expectations by adults is that they are transmitted to the child. Schoolchildren may internalize their parents' or teachers' belief that they will not learn. Expectations, motivation, and achievement go hand in hand. Qualities such as grit, resilience, and emotional regulation—all affected by parents, teachers, and the child's own hopes—are crucial for learning at every stage of life, as A View from Science explains.



a view from science

True Grit

Thousands of social scientists—psychologists, educators, sociologists, economists—have realized that, for cognitive development from middle childhood through late adulthood, characteristics beyond IQ scores, test grades, and family SES are sometimes pivotal. One leading proponent of this idea is Paul Tough, who wrote: "We have been focusing on the wrong skills and abilities in our children, and we have been using the wrong strategies to help nurture and teach those skills" (Tough, 2012, p. xv). Instead of focusing on test scores, we should focus on character, Tough believes.

Many scientists agree that executive control processes with many names (grit, emotional regulation, conscientiousness, resilience, executive function, effortful control) develop over the years of middle childhood and are crucial for cognitive growth. Over the long term, these aspects of character predict achievement in high school, college, and adulthood. Developmentalists disagree about exactly which qualities are crucial for achievement, with grit considered crucial by some and not others (Ivcevic & Brackett, 2014; Duckworth & Kern, 2011), but no one denies that success depends on personality traits, not just on intellect.

This concept appears in almost every chapter of this textbook, from the discussion of plasticity in Chapter 1 to the evidence in Chapter 11 regarding children who overcome notable learning disabilities. One of the best longitudinal studies we have (the Dunedin study of an entire cohort of children from New Zealand) found that measures of self-control before age 10 predicted health, happiness, education, and accomplishment many years later, even when IQ and SES were already taken into account (Moffitt et al., 2011).

Among the many influences on children, a pivotal one is having at least one adult who encourages accomplishment. For many children, that adult is their mother, although, especially when parents are neglectful or abusive, a teacher, a religious leader, a coach, or someone else can be the mentor and advocate who helps a child overcome adversity (Masten, 2014).

Remember that school-age children are ready for intellectual growth (Piaget) and are responsive to mentors (Vygotsky). These universals were evident in one study that occurred in two places, 12,000 miles apart: the Northeastern United States and Taiwan. More than 200 mothers were asked to recall and then discuss with their 6- to 10-year-olds two learning-related incidents that they knew their child experienced. In one incident, the child had a "good attitude or behavior in learning"; in the other, "not perfect" (Li et al., 2014).

All the mothers were married and middle-class, and all tried to encourage their children, stressing the value of education and the importance of doing well in school. All the children reflected their mothers' attitudes.

Although the researchers noted these universal aspects of the mother–child dialogues, they also found that the Chinese mothers were about 50 percent more likely to mention what the researchers called "learning virtues," such as practice, persistence, and concentration—all of which are part of grit. The American mothers were 25 percent more likely to mention "positive affect," such as happiness and pride.

This distinction is evident in the following two excepts:

First, Tim and his American mother discussed a "not perfect" incident.

Mother: I wanted to talk to you about . . . that time when you had that one math paper that . . . mostly everything was wrong and you never bring home papers like that. . . .

Tim: I just had a clumsy day.

Mother: You had a clumsy day. You sure did, but there was, when we finally figured out what it was that you were doing wrong, you were pretty happy about it . . . and then you were happy to practice it, right? . . . Why do you think that was?

Tim: I don't know, because I was frustrated, and then you sat down and went over it with me, and I figured it out right with no distraction and then I got it right.

Mother: So it made you feel good to do well?

Tim: Uh-huh.

Mother: And it's okay to get some wrong sometimes.

Tim: And I, I never got that again, didn't I?

The next excerpt occurred when Ren and his Chinese mother discuss a "good attitude or behavior."

Mother: Oh, why does your teacher think that you behave well?

Ren: It's that I concentrate well in class.

Mother: Is your good concentration the concentration to talk to your peer at the next desk?

Ren: I listen to teachers.

Mother: Oh, is it so only for Mr. Chang's class or is it for all classes?

Ren: Almost all classes like that. . . .

Mother: So you want to behave well because you want to get an . . . honor award. Is that so?

Ren: Yes.

Mother: Or is it also that you yourself want to behave better?

Ren: Yes. I also want to behave better myself.

[Li et al., 2014, p. 1218]

Both Tim and Ren are likely to be good students in their respective schools. When parents support and encourage their child's learning, almost always the child masters the basic skills required of elementary school students, and almost never does the child become crushed by life experiences. Instead, the child has sufficient strengths to overcome most challenges (Masten, 2014).

However, the specifics of parental encouragement affect the child's achievement. Some research has found that parents in Asia emphasize that education requires hard work, whereas parents in North America stress the joy of learning. It may be that some parents push their children to excel because they believe that their children's accomplishments reflect on them. The result, according to one group of researchers, is that U.S. children are happier but less accomplished than Asian ones (Ng et al., 2014).

ANSWER TO OBSERVATION QUIZ

(from page 390) Her posture is straight; her hands are folded; she is quiet, standing while her mother sits. All this suggests that this scene is a frequent occurrence.

SUMMING UP Children continue to learn language rapidly during the school years. They become more flexible, logical, and knowledgeable, figuring out the meanings of new words and grasping metaphors, jokes, and compound words. Many converse with friends using informal speech and master formal code in school. They learn whatever grammar and vocabulary they are taught, and they succeed at pragmatics —the practical task of adjusting their language to friends, teachers, or family. Millions become proficient in a second language, a process facilitated by teachers and peers, as well as by the overall culture and the parents' use of language. For academic achievement during middle childhood, both past exposure to language—ideally extensive, with varied vocabulary—and adults' expectations are influential.

WHAT HAVE YOU LEARNED?

1. How does learning language progress between the ages of 6 and 10?
2. How does a child's age affect the understanding of metaphors and jokes?
3. Why would a child's linguistic code be criticized by teachers but admired by friends?
4. What factors in a child's home and school affect language-learning ability?
5. What are three research conclusions regarding U.S. children whose home language is not English?
6. How and why does low SES affect language learning?

Teaching and Learning

As we have just described, school-age children are great learners, using logic, developing strategies, accumulating knowledge, and expanding language proficiency. In every nation, new responsibilities and formal instruction begin at about age 6, because that is when the human body and brain are ready for them.

Traditionally, learning occurred at home, but now United Nations data find that more than 95 percent of the world's 7-year-olds are in school; that is where their parents and political leaders want them to be. (See Visualizing Development, p. 404, for U.S. and international statistics on education in middle childhood.)

Indeed, in many developing nations the number of students in elementary school exceeds the number of school-age children, because many older children who missed some early learning are enrolled in primary education. In 2012, Ghana, El Salvador, and China were among the nations with significantly more students enrolled in primary school than the total population of children who were primary school age (UNESCO, 2012). That is not a good sign: Many of them eventually drop out without having learned to read, write, and calculate.

International Schooling

Everywhere children are taught to read, write, and do arithmetic. Because of brain maturation and sequenced learning, 6-year-olds are not expected to multiply three-digit numbers or read paragraphs fluently out loud, but every nation teaches 10-year-olds to do so. Some of the sequences recognized universally are listed in the At About This Time tables.

Nations also want their children to be good citizens. However, citizenship is not easy to teach. There is no consensus as to what good citizenship means or what developmental paths should be followed for children to learn it (Cohen & Malin, 2010). Accordingly, many children simply follow their parents example regarding everything from picking up trash to supporting a candidate for president.



Differences by Nation

Although literacy and numeracy (reading and math, respectively) are valued everywhere, many curriculum specifics vary by nation, by community, and by school. These variations are evident in the results of international tests, in the mix of school subjects, and in the relative power of parents, educators, and political leaders.

For example, daily physical activity is mandated in some schools but not in others. Many schools in Japan have swimming pools; virtually no schools in Africa or Latin America do. As you read in Chapter 11, some U.S. schools have no recess at all.

Geography, music, and art are essential in some places, not in others. Half of all U.S. 18- to 24-year-olds say they had no arts education in childhood, either in school or anywhere else (Rabkin & Hedberg, 2011) (see Figure 12.4). By contrast, schools in Finland consider arts education essential, with a positive impact on learning (Nevanen et al., 2014).

Educational practices may differ even between nations that are geographically and culturally close. For example, the average child in a primary school in Spain spends twice as much school time studying science as does the average child in Italy (145 versus 78 hours per year, respectively). Similar disparities occur in nations in which each region or district

at about this time

Math

Age	Norms and Expectations
4–5 years	• Count to 20. • Understand one-to-one correspondence of objects and numbers. • Understand *more* and *less*. • Recognize and name shapes.
6 years	• Count to 100. • Understand *bigger* and *smaller*. • Add and subtract one-digit numbers.
8 years	• Add and subtract two-digit numbers. • Understand simple multiplication and division. • Understand word problems with two variables.
10 years	• Add, subtract, multiply, and divide multidigit numbers. • Understand simple fractions, percentages, area, and perimeter of shapes. • Understand word problems with three variables.
12 years	• Begin to use abstract concepts, such as formulas, algebra.

Math learning depends heavily on direct instruction and repeated practice, which means that some children advance more quickly than others. This list is only a rough guide, meant to illustrate the importance of sequence.

at about this time

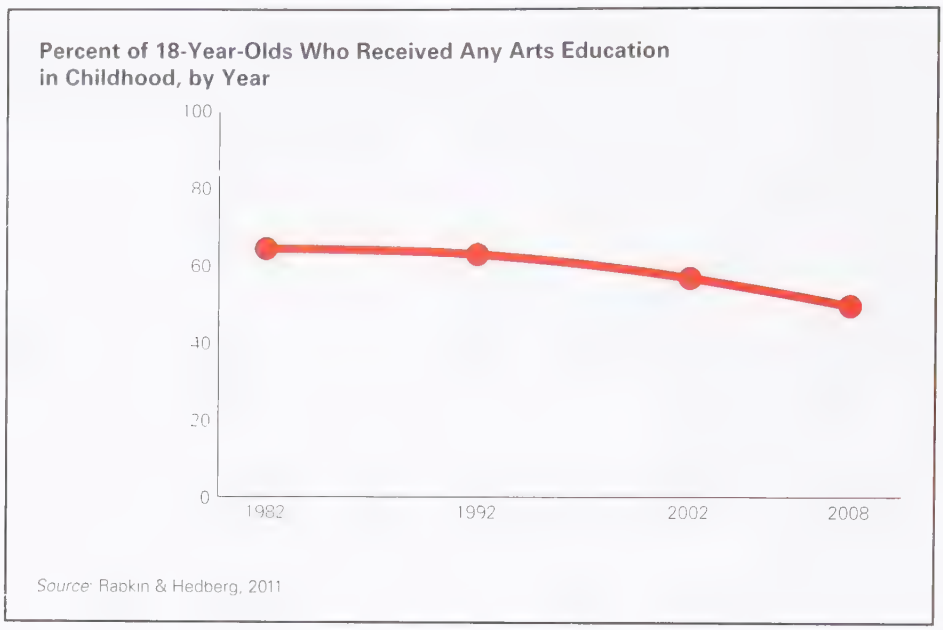
Reading

Age	Norms and Expectations
4–5 years	• Understand basic book organization, such as, for children learning English, that books are written front to back and that letters make words from left to right. • Recognize letters—name the letters on sight. • Recognize and spell own name.
6–7 years	• Know the sounds of the consonants and vowels, including those that have two sounds (e.g., *c, g, o*) and combinations (*th, br*). • Use sounds to figure out words. • Read simple words, such as *cat, sit, ball, jump*.
8 years	• Read simple sentences out loud, 50 words per minute, including words of two syllables. • Understand basic punctuation, consonant–vowel blends. • Comprehend what is read.
9–10 years	• Read and understand paragraphs and chapters, including advanced punctuation (e.g., the colon). • Answer comprehension questions about concepts as well as facts. • Read polysyllabic words (e.g., *vegetarian, population, multiplication*).
11–12 years	• Demonstrate rapid and fluent oral reading (more than 100 words per minute). • Vocabulary includes words that have specialized meaning in various fields. For example, in civics, *liberties, federal, parliament,* and *environment*. • Comprehend paragraphs about unfamiliar topics. • Sound out new words, figuring out meaning using cognates and context. • Read for pleasure.
13+ years	• Continue to build vocabulary, with greater emphasis on comprehension than on speech. Understand textbooks.

Reading is a complex mix of skills, dependent on brain maturation, education, and culture. The sequence given here is approximate; it should not be taken as a standard to measure any particular child

FIGURE 12.4

Focus on Facts As achievement test scores become the measure of learning, education in art, music, and movement has been squeezed out. Artists worry that creativity and imagination may be lost as well.



hidden curriculum The unofficial, unstated, or implicit rules and priorities that influence the academic curriculum and every other aspect of learning in a school.

is allowed to set local standards. For example in Canada, children in the province of Quebec study science about half as much as those in Ontario (50 compared to 92 hours per year) (Snyder & Dillow, 2013).

Differences between one nation and another, and, in the United States, between one school and another, may be dramatic in the **hidden curriculum,** which includes all the implicit values and assumptions of the school. The hidden curriculum is evident in course offerings, schedules, tracking, teacher characteristics, discipline, teaching methods, sports competition, student government, extracurricular activities, and so on.

Whether students should be quiet or talkative in the classroom is part of the hidden curriculum, taught from kindergarten on. I realized this when I taught at the United Nations high school. One student, newly arrived from India, never spoke in class so I called on him. He immediately stood up to answer—to the surprise of his classmates. Soon he learned to stay seated, but he never spoke spontaneously. Students are taught to express opinions or not, and that correlates with their later political responses in their nation, as passive or active citizens (Lin, 2014).

Same Situation, Far Apart: Spot the Hidden Curriculum Literacy is central to the curriculum for schoolchildren everywhere, no matter how far apart they live. However, in the U.S. classroom at the left, boys and girls learn together, clothes are casual, history books are paperback and illustrated, and children of every background read the same stories with the same patriotic—but not religious—themes. The hidden curriculum is quite different for the boy memorizing his holy book on the right.





OLIVIER MORIN/AFP/GETTY IMAGES





Having Fun? Not necessarily.

OBSERVATION QUIZ What three differences do you see between recess in New York City (left) and Santa Rosa, California (right)? (see answer, page 397)

The hidden curriculum is also thought to be the underlying reason for a disheartening difference in whether elementary school students respond to their teachers' offer of special assistance. In one study, middle-class children were likely to ask for help but lower-SES students were not: They wanted to avoid special attention, fearing it would lead to criticism (Calarco, 2014). This researcher concluded that the hidden curriculum of the social context, as well as the teachers' expectations, affected learning, unintentionally benefitting the middle-class students.

More generally, if teachers' gender, ethnicity, or economic background is unlike that of the students, children may conclude that education is irrelevant for them. If the school has gifted classes, the hidden message may be that all the rest of the students are not very capable.

The physical setting of the school also sends a message. Some schools have spacious classrooms, wide hallways, and large, grassy playgrounds; others have cramped, poorly equipped classrooms and cement play yards. In some nations, school is held outdoors, with no chairs, desks, or books. Sessions are canceled when it rains. What does that tell the students?

International Testing

Over the past two decades, more than 50 nations have participated in at least one massive international test of educational achievement. Longitudinal data reveal that when achievement rises, the national economy advances with it; this sequence seems causal, not merely correlational (Hanushek & Woessmann, 2009). Apparently, better-educated adults become more productive workers.

Science and math achievement are tested in the **Trends in Math and Science Study (TIMSS).** The main test of reading is the **Progress in International Reading Literacy Study (PIRLS).** These tests are given every few years, with East Asian nations usually ranking at the top. The rank of the United States has risen over the past two decades, but it is still below several nations in Eastern and Western Europe, as well as in Asia (see Tables 12.2 and 12.3). Most developing nations in Africa or South America do not give these tests, but when they do, their scores are low.

After a wholesale reform of the educational system, Finland's scores increased dramatically from about 1990 to 2011. Changes occurred over several years, including the abolishment of ability grouping in 1985 and curriculum reform in 1994 to encourage collaboration and active learning. Strict requirements for becoming a teacher are in place. Only the top 3 percent of Finland's high school graduates are

Trends in Math and Science Study (TIMSS) An international assessment of the math and science skills of fourth- and eighth-graders. Although the TIMSS is very useful, different countries' scores are not always comparable because sample selection, test administration, and content validity are hard to keep uniform

Progress in International Reading Literacy Study (PIRLS) Inaugurated in 2001, a planned five-year cycle of international trend studies in the reading ability of fourth-graders

TABLE 12.2 TIMSS Ranking and Average Scores of Math Achievement for Fourth-Graders, 2011

Rank*	Country	Score
1.	Singapore	606
2.	Korea	605
3.	Hong Kong	602
4.	Chinese Taipei	591
5.	Japan	585
6.	N. Ireland	562
7.	Belgium	549
8.	Finland	545
9.	England	542
10.	Russia	542
11.	United States	541
12.	Netherlands	540
	Canada (Quebec)	533
	Germany	528
	Canada (Ontario)	518
	Australia	516
	Italy	508
	Sweden	504
	New Zealand	486
	Iran	431
	Yemen	248

*The top 12 groups are listed in order, but after that, not all the jurisdictions that took the test are listed. Some nations have improved over the past 15 years (notably, Hong Kong, England) and some have declined (Austria, Netherlands), but most continue about where they have always been.

Source: Provasnik et al., 2012, Mullis et al., 2012a

TABLE 12.3 PIRLS Distribution of Reading Achievement

Country	Score
Hong Kong	571
Russia	568
Finland	568
Singapore	567
N. Ireland	558
United States	556
Denmark	554
Chinese Taipei	553
Ireland	552
England	552
Canada	548
Italy	541
Germany	541
Israel	541
New Zealand	531
Australia	527
Poland	526
France	520
Spain	513
Iran	457
Colombia	448
Indonesia	428
Morocco	310

Source: Adapted from Mullis et al., 2012b

admitted to teachers' colleges. They study five years at the university at no charge, earning a master's degree in the theory and practice of education.

Finnish teachers are also granted more autonomy within their classrooms than is typical in other systems, and since the 1990s, they have had more time and encouragement to work with colleagues (Sahlberg, 2011). Buildings are designed to foster collaboration, with comfortable teacher's lounges (Sparks, 2012) that reflect a hidden curriculum regarding teacher professionalism. The teachers also belong to a union—again, a sign of respect.

Respect for teaching might be the reason for Finland's success, or perhaps the reasons are more basic, such as Finland's size, population, culture, or history.

The crucial difference may be expectations: Every child is assumed to have strengths and weaknesses that the teacher uses to find the right combination of approaches that will foster learning. Almost no child is designated for special education because *all* are given individualized attention.

International test results reflect educational approaches in various nations, as well as cultural values. TIMSS experts videotaped 231 math classes in Japan, Germany, and the United States (Stigler & Hiebert, 2009). The U.S. teachers taught math at a lower level than did their German and Japanese counterparts, presenting more definitions disconnected to prior learning. Few U.S. students seemed engaged in math because they felt the "teachers seem to believe that learning terms and practicing skills is not very exciting" (p. 89).

By contrast, the Japanese teachers were excited about math instruction, working collaboratively and structuring lessons so that the children developed proofs and alternative solutions, both alone and in groups. Teachers used social interaction and followed an orderly sequence (building lessons on previous knowledge). Japanese teaching reflected all three theories of cognition: children's creative problem solving from Piaget, collaborative learning from Vygotsky,



DEBRA NODA MODESTO BEE 2

Sharing Answers After individually subtracting 269 from 573, these two third-graders check their answers two ways—first by adding and then by showing their work to each other. As you can see, he is not embarrassed at his mistake because students in this class enjoy learning from each other.



and sequencing from information processing. Since Japanese students excel on the TIMSS, the teachers' use of strategies from all three theories may lead to student success.

Problems with International Benchmarks

Elaborate and extensive measures are in place to make the PIRLS and the TIMSS valid. For instance, test items are designed to be fair and culture-free, and participating children represent the diversity (economic, ethnic, etc.) of the child population. Consequently, most social scientists respect the data gathered from these tests.

The tests are far from perfect, however. Designing test items that are equally challenging to every student in every nation is impossible. Should fourth-graders be expected to understand fractions, graphs, and simple geometry, or should the test examine only basic operations with whole numbers? Once such general issues are decided so that every child has an equal chance, then specific items need to be written, again with an effort to be equally fair to every culture. The following item was used to test fourth-grade math:

> Al wanted to find out how much his cat weighed. He weighed himself and noted that the scale read 57 kg. He then stepped on the scale holding his cat and found that it read 62 kg. What was the weight of the cat in kilograms?

This problem involves simple subtraction, yet 40 percent of U.S. fourth-graders got it wrong. Were they unable to subtract 57 from 62? Did they not understand the example? Did the abbreviation for kilograms confuse them because—unlike children in most nations—they are more familiar with pounds? On this item, children from Yemen were at the bottom, with 95 percent of them failing. Is that because few of them have cats for pets or weigh themselves on a scale? As you see, national and cultural contexts may affect test scores.

Gender Differences in School Performance

In addition to marked national, ethnic, and economic differences, gender differences in achievement scores are reported. The PIRLS finds girls ahead of boys in verbal skills in every nation by an average of 16 points. The female advantage is not that high in the United States, with the 2011 PIRLS finding girls 10 points ahead. This meant that they were about 2 percent ahead of the average boy, an advantage—similar to Canada, Germany, and the Netherlands—suggesting that those nations are closer in gender equality than the average PIRLS nation.

Traditionally, boys were ahead of girls in math and science. However, the 2011 TIMSS reported that gender differences among fourth-graders in math have narrowed or disappeared. In most nations, boys are still slightly ahead, with the United States showing the greatest male advantage (9 points). However in many nations, girls are ahead, sometimes by a great deal, such as 14 points in Thailand and 35 points in Kuwait. Such results lead to a *gender-similarities hypothesis* that males and females are similar on most test measures, with "trivial" exceptions (Hyde et al., 2008, p. 494).

Unlike test results, classroom performance during elementary school shows gender differences in almost every nation. Girls have higher report card grades overall, including in math and science. Then, at puberty, girls' grades dip, especially in science, and in college, fewer women choose STEM (Science, Technology, Engineering, Math) majors, and even fewer pursue STEM careers. For instance, in the United States as in most nations, although women earn more college degrees than men, in 2011 only 22 percent of the doctorates in engineering were awarded to women (Snyder & Dillow, 2013).

ANSWER TO OBSERVATION QUIZ (from page 395): The most obvious is the play equipment, but there are two others that make some New York children eager for recess to end. Did you notice the concrete play surface and the winter jackets?

LaunchPad



Video Activity: Educating the Girls of the World examines the situation of girls' education around the world while stressing the importance of education for all children.

Many reasons for gender differences in educational attainment have been suggested, with the social context of the elementary school classroom being crucial (Legewie & DiPrete, 2012). Perhaps school itself is more connected with feminism than masculinity. Indeed, children are all expected to sit still and concentrate, which may be easier for girls than boys. If sexual attractiveness becomes crucial at puberty, girls may underachieve because they think boys will not be attracted to them if they are too smart. As adults they believe that a career in science will clash with becoming good mothers and wives.

An alternate explanation is that social prejudice and the hidden curriculum favors young girls but not young women. Since most elementary school teachers are women, girls in the early grades may feel (or be) more encouraged than boys. Then, when adolescents begin to prepare for adulthood, most seek the roles that have typically been held by their sex—nurse, not doctor; secretary, not CEO; and definitely not mathematician, physicist, or engineer. Explanations for the gender gap in STEM fields have shifted over the past 40 years: Analysts once blamed the female brain or body; currently blame more often falls on culture or society (Kanny et al., 2014).

The following A Case to Study is an example: Do you think Paul became a low achiever because he was male, or because he was Mexican, or because his school failed him?

a case to study

Two Immigrants

Two children, both Mexican American, describe their experiences in their local public school in California.

Yolanda:

When I got here [from Mexico at age 7], I didn't want to stay here, 'cause I didn't like the school. And after a little while, in third grade, I started getting the hint of it and everything and I tried real hard in it. I really got along with the teachers. . . . They would start talking to me, or they kinda like pulled me up some grades, or moved me to other classes, or took me somewhere. And they were always congratulating me.

Paul:

I grew up . . . ditching school, just getting in trouble, trying to make a dollar, that's it, you know? Just go to school, steal from the store, and go sell candies at school. And that's what I was doing in the third or fourth grade. . . . I was always getting in the principal's office, suspended, kicked out, everything, starting from the third grade.

[quoted in Nieto, 2000, pp. 220, 249]

Note that initially Yolanda didn't like the United States because of school, but her teachers "kind of pulled me up." By third grade, she was beginning to get "the hint of it."

For Paul, school was where he sold stolen candy and where his third-grade teacher sent him to the principal, who suspended him. Ms. Nelson's fifth grade was "a good year," but it was too late; he had already learned he was "just a mess-up," and his expectations for himself were low.

Paul was later sent to a special school, and the text implies that he was in jail by age 18. Yolanda became a successful young woman, fluently bilingual.

It would be easy to conclude that the difference was gender, since girls generally do better in school than boys, but that is too simple. Some Mexican-born boys do well in California schools, which raises the question of how teachers impact children: What could the third-grade teacher have done for Paul?

Schooling in the United States

Although most national tests indicate improvements in U.S. children's academic performance over the past decade, when U.S. children are compared with children in other nations, they are still far from the top. A particular concern is that a child's achievement seems to be more influenced by income and ethnicity in the

United States than in other nations. Some high-scoring nations have more ethnic groups and immigrants than the United States, so diversity itself is not the reason.

Each state and each school district in the United States determines school policy and funding, with one result being notable disparities. For example, Massachusetts and Minnesota are consistently at the top of state achievement, and West Virginia, Mississippi, and New Mexico are at the bottom—in part because of the investment in education within those states as well as the proportion of students of high or low SES (which itself affects state spending) (Pryor, 2014).

Also in the United States, although many educators and political leaders have attempted to eradicate performance disparities linked to a child's background, the gap between fourth-grade European Americans and their Latino and African American peers is as wide as it was 15 years ago (Snyder & Dillow, 2013). Furthermore, the gap between low- and high-income U.S. students is widening, as is the gap between Native Americans and other groups (Maxwell, 2012).



"Big deal, an A in math. That would be a D in any other country."

MIKE TWOHY/THE NEW YORKER COLLECTION/WWW.CARTOONBANK.COM

National Standards

International comparisons as well as disparities within the United States led to passage of the **No Child Left Behind Act (NCLB)** of 2001, a federal law promoting high national standards for public schools. One controversial aspect of the law is that it requires frequent testing to measure whether standards are being met. Low-scoring schools lose funding and may be closed. An unfortunate result is that children of average achievement are pushed to meet the benchmark, while children far above or far below may be ignored.

No Child Left Behind Act A U.S. law enacted in 2001 that was intended to increase accountability in education by requiring states to qualify for federal educational funding by administering standardized tests to measure school achievement.

Most people agree with the NCLB goals (accountability and higher achievement) but not with the strategies that must be used (Frey et al., 2012). NCLB troubles those who value the arts, social studies, or physical education because those subjects are often squeezed out when reading and math achievement are the ultimate priorities (Dee et al., 2013). States have been granted substantial power of implementation. Teacher evaluation and preparation has increased, but class size has not decreased, and the tests, and testing, remain controversial (Frey et al., 2012; Dee et al., 2013).

For decades, federally sponsored tests called the **National Assessment of Educational Progress (NAEP)** have measured achievement in reading, mathematics, and other subjects. Many critics believe that the NAEP is more realistic than state tests because the NAEP labels fewer children proficient. For example in the state of New York, state tests found 62 percent proficient in math, but the NAEP found only 32 percent; 51 percent were found proficient in reading on the state tests but only 35 percent according to NAEP (Martin, 2014).

National Assessment of Educational Progress (NAEP) An ongoing and nationally representative measure of U.S. children's achievement in reading, mathematics, and other subjects over time; nicknamed "the Nation's Report Card."

Disagreement about state tests and standards led the governors of all 50 states to designate a group of experts who developed a *Common Core* of standards, finalized in 2010, for use nationwide. The standards, more rigorous than most state standards, are quite explicit, with half a dozen or more specific expectations for achievement in each subject for each grade. (Table 12.4 provides a sample of the specific standards.) As of 2013, forty-four states adopted this Common Core for both reading and math. Minnesota is a partial adopter, in reading but not in math, and five states—Texas, Virginia, Alaska, Indiana, and Nebraska—opted out of the Common Core.

Most teachers were initially in favor of the Common Core, but implementation has turned many against it. In 2013, a poll by Education Next found only 12 percent of teachers were opposed to the Common Core; a year later, 40 percent were (Gewertz, 2014). Likewise, many state legislators as well as the general public have doubts about the Common Core. This is another example of a general finding: Issues regarding how best to teach children, and what they need to learn, are controversial among teachers, parents, and political leaders.

TABLE 13.3 The Common Core: Sample Items for Each Grade

Grade	Reading and Writing	Math
Kindergarten	Pronounce the primary sound for each consonant.	Know number names and the count sequence
First	Decode regularly spelled one-syllable words	Relate counting to addition and subtraction (e.g., by counting 2 more to add 2)
Second	Decode words with common prefixes and suffixes	Measure the length of an object twice, using different units of length for the two measurements; describe how the two measurements relate to the size of the unit chosen
Third	Decode multisyllabic words	Understand division as an unknown-factor problem. For example, find 32 ÷ 8 by finding the number that makes 32 when multiplied by 8
Fourth	Use combined knowledge of all letter–sound correspondences, syllable patterns, and morphology (e.g., roots and affixes) to read accurately unfamiliar multisyllabic words in context and out of context	Apply and extend previous understandings of multiplication to multiply a fraction by a whole number
Fifth	With guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, and rewriting, or trying a new approach.	Graph points on the coordinate plane to solve real-world and mathematical problems

Source: National Governors Association, 2010

Learning a Second Language

One example of such a controversy involves determining when, how, to whom, and whether schools should provide second-language instruction. These questions are answered in opposite ways from one nation to another. Some nations teach two or more languages throughout elementary school, and others punish children who utter any word in any language other than the majority one.

In the United States, less than 5 percent of children under age 11 study a language other than English in school (Robelen, 2011). (In secondary school, most U.S. students take a year or two of a language other than English, but studies of brain maturation suggest that this is too late for efficient language learning.)

Some U.S. educators note that almost every child studies two languages by age 10 in Canada as well as in most nations of Europe. African children who are talented and fortunate enough to reach high school often speak three languages. The implications of this for U.S. language instruction are often ignored because of debates about immigration and globalization. Instead of trying to teach English-speaking children a second language during the years when they are best able to learn it, educators in the United States debate how best to teach English to children who do not speak it, a topic discussed above.



All the Same These five children all speak a language other than English at home and are now learning English as a new language at school. Although such classes should ideally be taught to true English language learners (ELLs), children who already speak English are sometimes mistakenly included in them (like 8-year-old Elena, from Mexico).

Choices and Complications

An underlying issue for almost any national or international school is the proper role of parents. In most nations, matters regarding public education—curriculum, funding, teacher training, and so on—are set by the central government. Almost all children attend the local school, whose resources and standards are similar to those of the other schools in that nation. In those nations, the parents' job is to support the child's learning, by checking homework and so on.

In contrast to that model, local districts in the United States provide most of the funds and guidelines, and parents, as voters and volunteers, are often active in their child's school. As part of the trend toward fewer children per family, parents are increasingly ready to move their children from one public school to another. Parents befriend their child's teacher, join parent–teacher associations (PTAs), move to another school zone, vote for local officials who have particular policies in education, and so on.

Although most U.S. parents send their children to the nearest public school, almost one-third do not. Other choices include a more distant public school, a public charter school, a private school, or home schooling (see Figure 12.5).

The existence of all of these options creates a problem. It is difficult for parents to decide the best school for their child, partly because neither the test scores of students in any of these schools, nor the moral values a particular school may espouse, correlate with the cognitive skills that developmentalists seek to foster (Finn et al., 2014). Thus, parents may choose a school that may not actually be the best educational experience for their child. Schools that enroll only children from selected families may publish high scores, but not because of the school.

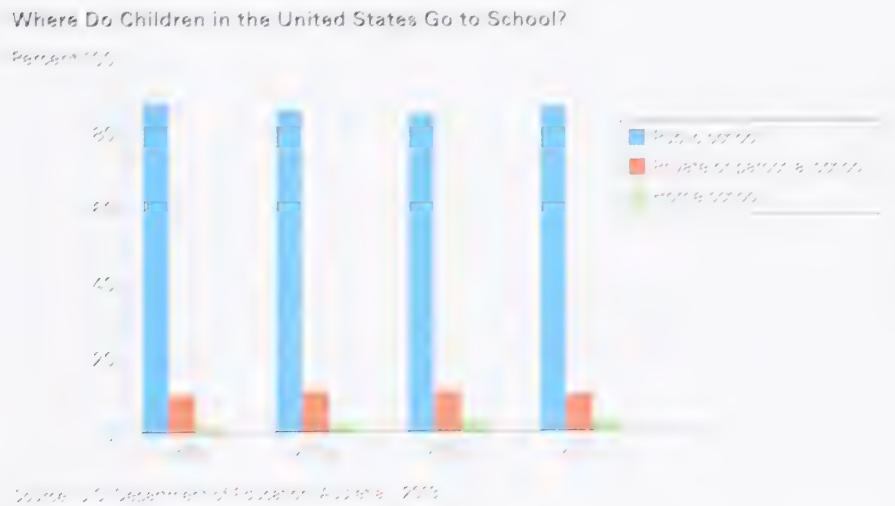


FIGURE 12.5

Where'd You Go to School? You can see that home schooling is the least-chosen option, but the number of home-schooled children is increasing. Where the number of children attending private is generally decreasing. Although any one can be home-schooled in the United States (not in some other nations), data do not indicate that home schooling is more common in the early grades, especially where public schools are not nearly as safe in Alaska and Texas, and less common in large schools.

Charter Schools

Charter schools are public schools funded and licensed by states or local districts. Typically, they also have private money and sponsors. They are exempt from some regulations, especially those negotiated by teacher unions (hours, class size, etc.), and they control admissions and expulsions. They are more ethnically segregated and enroll fewer children with special needs (Stern et al., 2014).

charter school A public school with its own set of standards that is funded and [illegible] by a state or local district in exchange for [illegible]

On average, teachers at charter schools are younger and work longer hours than regular public school teachers, and school size is smaller than in traditional schools. Perhaps 4 percent of U.S. children are in charter schools.

Some charter schools are remarkably successful; others are not (Clark et al., 2014). A major criticism is that not every child who enters a charter school stays to graduate: one scholar reports that "the dropout rate for African American males is shocking" (Miron, quoted in Zehr, 2011b, p. 1). Children and teachers leave charter schools more often than they leave regular public schools, a disturbing statistic.



Loved and Rewarded Marissa Ochoa, a third-grade public school teacher near San Diego, California, is shown moments after she learned that she won $5,000 as a star educator. Which do you think is more rewarding to her, the money or the joy of her students?

OBSERVATION QUIZ The photo above shows Marissa's students congratulating their teacher. What do you see in the hidden curriculum? (see answer, page 405)

Overall, the charter school question is complex, with so much variation from state to state, and school to school (some schools sought by many parents, some avoided for good reasons) that it is difficult to judge charters as a group.

Private Schools

Private schools are funded by tuition, endowments, and church sponsors. Traditionally in the United States, most private schools were parochial (church related), organized by the Catholic Church to teach religion and to resist the anti-Catholic rhetoric of many public schools. Tuition was low since teachers were nuns who earned little pay.

Recently, many Catholic schools have closed, and other church-related schools have opened as have more independent private schools. All told, about 10 percent of students in the United States attend private schools. Economic factors are a major concern: High tuition means that few private-school children are poor or even middle class.

To solve that problem, some U.S. jurisdictions issue **vouchers,** money that parents can use to pay some or all of the tuition at a private school, including a church-sponsored one. This practice is controversial, not only because it decreases public school support but also because public funds go to religious institutions, contrary to the U.S. principle of separation of church and state. Advocates say that vouchers increase competition and improve all schools; critics counter that they weaken public schools and are costly to taxpayers.

private school A school funded by tuition charges, endowments, and often religious or other nonprofit sponsors.

voucher A public subsidy for tuition payment at a nonpublic school. Vouchers vary a great deal from place to place, not only in amount and availability but also in restrictions as to who gets them and what schools accept them.

home schooling Education in which children are taught at home, usually by their parents.

• Home Schools

Home schooling occurs when parents avoid both public and private schools by educating their children at home. In most U.S. states, authorities set standards for what a child must learn, but home-schooling families decide specifics of curriculum, schedules, and discipline. This choice has become more common: About 2 percent of all children were home schooled in 2003, about 3 percent in 2007, and perhaps slightly more in 2012 (Snyder & Dillow, 2013; Ray, 2013). Numbers are not expected to continue to increase, because home schooling requires an adult at home, typically the mother in a two-parent family, who is willing to teach the children. Such mothers are increasingly scarce.

The major problem with home schooling is not academic (some mothers are conscientious teachers and some home-schooled children score high on achievement tests) but social: Children have no interaction with classmates. To compensate, many home-schooling parents plan activities with other home-schooling families. This practice reflects local culture: Home schooling is more common in some parts of the United States (in the South and the Northwest more than in the Northeast or Midwest), which affects how readily parents can find other home-schooled children.

How to Decide?

The underlying problem with all these options is that people disagree about the best education for a 6- to 11-year-old and about how to measure learning. For example, many parents consider class size to be a major issue: They may choose private school, if they can afford it, because fewer students are in each class. They also insist that children have homework, beginning in the first grade. Yet few

developmentalists are convinced that either small classes or daily homework are essential for cognitive development during middle childhood.

Mixed evidence comes from nations where children score high on international tests. Sometimes they have large student–teacher ratios (Korea's average is 28 to 1) and sometimes small (Finland's is 14 to 1). Fourth-graders with no homework sometimes have higher achievement scores than those with homework (Snyder & Dillow, 2010). This does not prove that small classes and extensive homework are worthless. Perhaps weaker students are assigned to smaller classes with more homework? If so, the data on homework or class size may be the results of low-scoring children, not vice versa. Nevertheless, these correlations raise doubts.

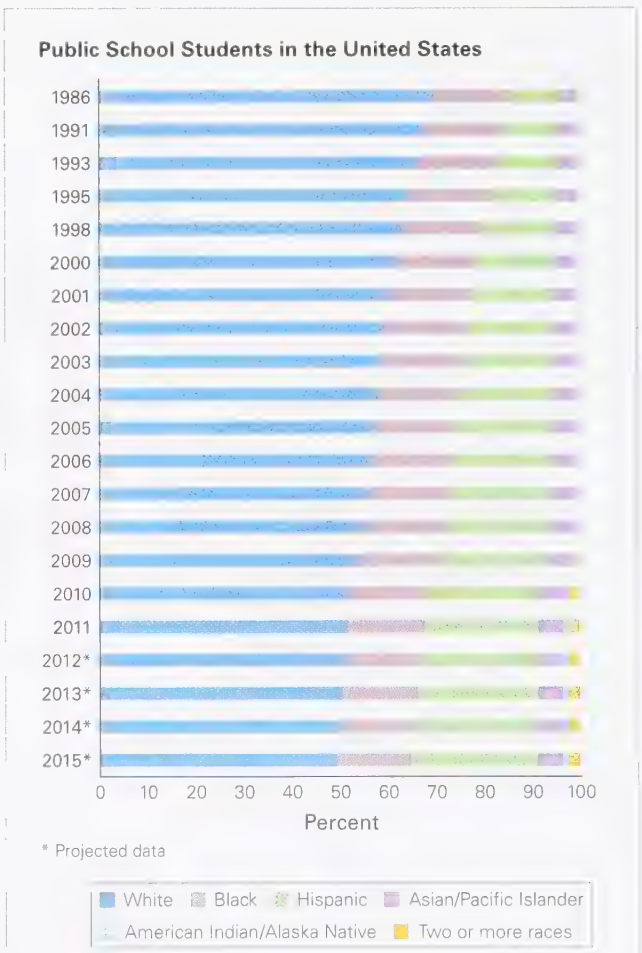
Who should decide what children should learn and how? Every developmental theory can lead to suggestions about education, but implementation is difficult. Statistical analysis raises questions about homeschooling and about charter schools (Lubienski et al., 2013; Finn et al., 2014), but as our discussion of NAEP, Common Core, TIMSS, and so on makes clear, the evidence allows many interpretations. As one review notes, "the modern day, home-based, parent-led education movement . . . stirs up many a curious query, negative critique, and firm praise" (Ray, 2013, p. 378). Parents, politicians, and developmental experts all agree that school is vital for development and that some children learn much more than others, but disagreement about teachers and curriculum—hidden or overt—abound.

Especially for School Administrators
Children who wear uniforms in school tend to score higher on reading tests. Why? (see response, page 405)

OBSERVATION QUIZ Why is the earlier data reported every few years, and the later years every year? (see answer, page 405)

A Word on Ethnic Diversity

As of 2014 in the United States, the nation's public schools are said to have become "majority minority," which means that most students are from groups that once were called minorities—such as African American, Latino, or Asian American (Krogstad & Fry, 2014) (see Figure 12.6). From a developmental perspective, the terms *majority* and *minority* are misleading, since the majority category includes many children whose ancestors came from distinct parts of Europe, and the minority category likewise includes many groups. Regarding cognitive development, though,



Source: National Center for Education Statistics, 2013; UNESCO *Global education digest*, various years

FIGURE 12.6
Opportunity Increasing As you know, each ethnic group measured by U.S. statistics is much more diverse than the broad categories shown here. On this chart, the "white" category may be particularly misleading, since children with heritage from Siberia, Baghdad, Dublin, and Oslo are all in that category, despite many religious and cultural differences among them. The two most numerous white categories are children of German or English heritage, but some of their ancestors arrived on the Mayflower and some by jet, with the largest wave coming by steerage between 1870 to 1930. Arrival date and circumstances affect each family. Nonetheless, crude as it is, this chart shows increasing intellectual opportunity: Cognitive growth occurs when people from diverse backgrounds listen to each other.

As you remember from Chapter 1, "race" is a questionable category. In the United States, Hispanic people are of any race, but all are Latino with heritage from Mexico or farther south. Some of them speak only English and have lived in the United States for generations. The category "two or more races" was not offered until recently. Therefore it has not increased as much as it seems to have, since biracial students were considered to be of one race before 2008. This chart shows public school students only, but since 90 percent of U.S. students are in public schools, and since overt racial discrimination is illegal, the addition of private school students would not change the totals significantly.

VISUALIZING DEVELOPMENT

Education in Middle Childhood Around the World

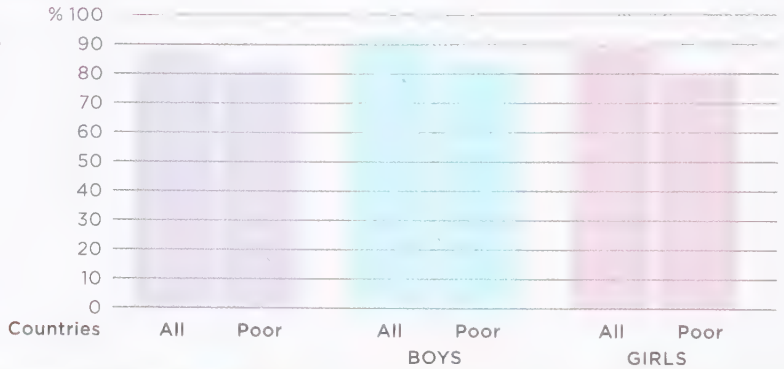
Only a decade ago, gender differences in education around the world were stark, with far fewer girls in school than boys. Now girls have almost caught up. However, many of today's children suffer from past educational inequality: Recent data find that the best predictor of childhood health and learning is an educated mother.

WORLDWIDE PRIMARY SCHOOL ENROLLMENT, 2011

Enrollments in elementary school are increasing around the world, but poor countries still lag behind more wealthy ones, and in all countries, more boys attend school than girls. These data are for almost all 6- to 11-year-olds. About 10 percent leave school by age 10.



BARBARA DELGADO/SHUTTERSTOCK



SOURCE: THE WORLD BANK, 2014

LESS

- Child and maternal mortality
- Transmission of HIV
- Early marriage and childbirth
- War

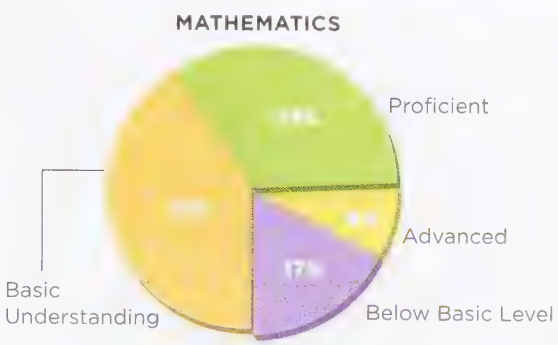
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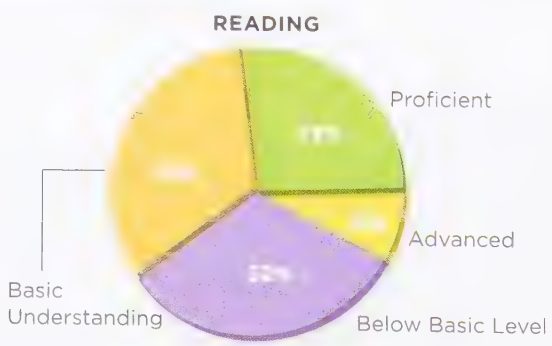
- Better-paying jobs
- Agricultural productivity
- Use of medical care
- Voting

SOURCE: HANUSHEK & WÖSSMANN, 2007

HOW ARE U.S. FOURTH-GRADERS DOING?

Primary school enrollment is high in the United States, but not every student is learning. While numbers are improving, less than half of fourth-graders are proficient in math and reading.





SOURCE: ADAPTED FROM NATIONAL CENTER FOR EDUCATION STATISTICS, 2013A, FIGURE 1



SOURCES & CREDITS LISTED ON P. SC-1



in middle childhood, every child advances, with specifics dependent far more on each individual's particular experiences than on his or her ethnic background.

Cognitive research leaves no doubt that, barring severe impairment, all school-age children *can* learn a second language and become skilled in math, reading, writing, and so on if they are taught logically, step-by-step. Whether they do so, however, is affected by SES, expectations, school practices, and national policies.

Children also learn best from personal contact, as might be expected during the period of concrete operational thinking. If well taught during middle childhood, children can learn about various groups, becoming sensitive to prejudice against any of their peers—whether based on gender, ethnicity, religion, or national origin (Bigler & Wright, 2014).

School children's ability to be logical and teachable, now that they are no longer preoperational and egocentric, makes this a good time to teach them to be proud of who they are, as well as to learn about their classmates. Ideally, they are fortunate enough to have a diverse classroom and a teacher who appreciates differences and similarities. Schools and homes both have a marked impact on what a child learns, and, as this chapter details again and again, children are ready to learn whatever their social context teaches them.

SUMMING UP Societies throughout the world recognize that school-age children are avid learners and that educated citizens are essential to economic development. This has led to increased school enrollment: Almost all 6- to 11-year-olds are in school. Schools differ in what and how children are taught. International tests find that some nations are far more successful than others in educating their young. Among the top-scoring nations on the TIMSS and the PIRLS are Finland and the nations of East Asia. Since the United States is far from the best, internationally, many parents and politicians have implemented reforms, including No Child Left Behind, the Common Core, charter schools, and vouchers. It is not clear which, if any of these, improves learning for school-age children. Test scores, as well as the nature and content of education, raise ideological and political passions. Teachers are crucial, and so are parents, who foster children's basic skills and motivation.

WHAT HAVE YOU LEARNED?

1. What do all nations have in common regarding education in middle childhood?
2. How does the hidden curriculum differ from the stated school curriculum?
3. What are three different ways in which ELLs are taught English in school?
4. What are the TIMSS and the PIRLS?
5. What are the national and international differences in school achievement of girls and boys?
6. What problems do the Common Core standards attempt to solve?
7. How do charter schools, private schools, and home schools differ?

/ ANSWER TO OBSERVATION QUIZ (from page 402): All the closest students are girls. What have the boys learned that is not part of the official curriculum?

// Response for School Administrators (from page 403): The relationship reflects correlation, not causation. Wearing uniforms is more common when the culture of the school emphasizes achievement and study, with strict discipline in class and a policy of expelling disruptive students.

// ANSWER TO OBSERVATION QUIZ (from page 403): Every year is needed to show recent trends. As you see, there was less yearly change before 2000. Note also that these numbers are *percentages* of children of various backgrounds. The absolute numbers have increased in every group.

SUMMARY

Building on Theory

1. According to Piaget, middle childhood is the time of concrete operational thought, when egocentrism diminishes and logical thinking begins. School-age children can understand classification, conservation, and seriation.
2. Vygotsky stressed the social context of learning, including the specific lessons of school and learning from peers and adults. Culture affects not only what children learn but also how they learn.
3. An information-processing approach examines each step of the thinking process, from input to output, using the computer as a model. This approach is useful for understanding memory, perception, and expression.
4. Memory begins with information that reaches the brain from the sense organs. Then, selection processes, benefiting from past experience, allow some information to reach working memory. Finally, long-term memory indefinitely stores images and ideas that can be retrieved when needed.
5. A broader knowledge base, logical strategies for retrieval, and faster processing advance every aspect of memory and cognition. Control processes are crucial. Children become better at controlling and directing their thinking as the prefrontal cortex matures. Metacognition and executive processing improve over the years of middle childhood and beyond.

Language

6. Language learning advances in many practical ways, including expanded vocabulary. Words are logically linked together and an understanding of metaphors begins.
7. Children excel at pragmatics during middle childhood, often using one code with their friends and another in school. Many children become fluent in the school language while speaking their first language at home.
8. Children of low SES are usually lower in linguistic skills, primarily because they hear less language at home and because adult expectations for their learning are low. This is not inevitable for low-SES families, however.

Teaching and Learning

9. Nations and experts agree that education is critical during middle childhood. Almost all the world's children now attend primary school. Schools differ in what and how they teach, especially with regard to religion, languages, and the arts.
10. International assessments are useful as comparisons, partly because few objective measures of learning are available. Reading is assessed with the PIRLS, math and science with the TIMSS. On both measures, children in East Asia excel and children in the United States are in the middle ranks.
11. In the United States, the No Child Left Behind Act and the National Assessment of Educational Progress (NAEP) attempt to raise the standard of education, with mixed success. The Common Core, developed with the sponsorship of the governors of the 50 states, is an effort to raise national standards and improve accountability.
12. Nations differ in how much overall control the central government has on education and how much choice and influence parents have. Unlike almost all other countries, in the United States, each state, each district, and sometimes each school retains significant control. Education is a political issue as much or more than a developmental one.
13. Disagreements about the best type of school are frequent; some parents choose charter schools, others prefer private schools, and still others opt for home schooling. However, some parents value particular aspects of schooling (class size, homework) more than do many educators. More research is needed to discover what is best.

KEY TERMS

concrete operational thought (p. 377)
classification (p. 378)
seriation (p. 378)
sensory memory (p. 382)
working memory (p. 382)
long-term memory (p. 383)
knowledge base (p. 383)
control processes (p. 384)
metacognition (p. 384)
executive function (p. 384)
ELLs (English Language Learners) (p. 388)
immersion (p. 388)
bilingual schooling (p. 388)
ESL (English as a Second Language) (p. 388)
hidden curriculum (p. 394)
Trends in Math and Science Study (TIMSS) (p. 395)
Progress in International Reading Literacy Study (PIRLS) (p. 395)
No Child Left Behind Act (p. 399)
National Assessment of Educational Progress (NAEP) (p. 399)
charter school (p. 401)
private school (p. 402)
voucher (p. 402)
home schooling (p. 402)

APPLICATIONS

1. Visit a local elementary school and look for the hidden curriculum. For example, do the children line up? Why or why not, when and how? Does gender, age, ability, or talent affect the grouping of children or the selection of staff? What is on the walls? Are parents involved? If so, how? For everything you observe, speculate about the underlying assumptions.
2. Interview a 6- to 11-year-old child to find out what he or she knows *and understands* about mathematics. Relate both correct and incorrect responses to the logic of concrete operational thought.
3. What do you remember about how you learned to read? Compare your memories with those of two other people, one at least 10 years older and the other at least 5 years younger than you are. Can you draw any conclusions about effective reading instruction? If so, what are they? If not, why not?
4. Talk to two parents of primary school children. What do they think are the best and worst parts of their children's education? Ask specific questions and analyze the results.



LEFT: WMAY/GETTY IMAGES
RIGHT: GEORGE DOYLE/GETTY IMAGES

CHAPTER 13

Middle Childhood: Psychosocial Development



1. What helps some children thrive in a difficult family, school, or neighborhood?
2. Should parents marry, risking divorce, or not marry, and thus avoid divorce?
3. What can be done to stop a bully?
4. When would children lie to adults to protect a friend?

"But Dad, that's not fair! Why does Keaton get to kill zombies and I can't?"

"Well, because you are too young to kill zombies. Your cousin Keaton is older than you, so that's why he can do it. You'll get nightmares."

"That's soooo not fair."

"Next year, after your birthday, I'll let you kill zombies."

[adapted from Asma, 2013]

This conversation between a professor and his 8-year-old illustrates psychosocial development in middle childhood, explained in this chapter. All children want to do what the bigger children do, and all parents seek to protect their children, sometimes ineffectively. Throughout middle childhood, issues of parents and peers, fairness and justice, inclusion and exclusion are pervasive. Age takes on new importance, as concrete operational thinking makes chronology more salient, and age-based cutoffs are the usual mode that schools, camps, and athletic leagues decide if a given child is "ready."

I still remember who was the youngest, and the oldest, child in my fourth grade class—even though we all were born within the same 12 months. In the excerpt above, the professor hoped his son would no longer want to kill zombies when he was 9, but as you will see, a child's sense of fairness often differs from an adult's. Morality is the final topic of this chapter, but even the first topic, the nature of the child, raises ethical as well as psychosocial questions.

- The Nature of the Child
  - Industry and Inferiority
  - Self-Concept
  - Culture and Self-Esteem
  - Resilience and Stress
- Families and Children
  - Shared and Nonshared Environments
  - A VIEW FROM SCIENCE: "I Always Dressed One in Blue Stuff. . . "
  - Family Structure and Family Function
  - A VIEW FROM SCIENCE: Divorce
  - Connecting Family Structure and Function
  - A CASE TO STUDY: How Hard Is It to Be a Kid?
  - Family Trouble
- The Peer Group
  - The Culture of Children
  - Friendships
  - Popular and Unpopular Children
  - Bullies and Victims
- Children's Moral Values
  - Moral Reasoning
  - What Children Value

The Nature of the Child

As explained in the previous two chapters, steady growth, brain maturation, and intellectual advances make middle childhood a time for more independence (see At About This Time). One practical result is that between ages 6 and 11, children learn to care for themselves. They not only hold their own spoon but also make their own lunch, not



JOE POLLIO/GETTY IMAGES

Adults Stay Out In middle childhood, children want to do things themselves. What if parents grabbed each child's hand and wanted to jump in, too? That would spoil the fun.

only zip their own pants but also pack their own suitcases, not only walk to school but also organize games with friends.

They venture outdoors alone, if their parents let them, and some experts think that parents should do just that (Rosin, 2014). Over the same years, parent–child interactions shift from primarily physical care (bathing, dressing, and so on) to include more conversation. Parents talk to their children about values, a trend particularly apparent with boys and their fathers (Keown & Palmer, 2014). The child's budding independence fosters growth. Parental guidance is still important even though the specifics may change.

Industry and Inferiority

Throughout the centuries and in every culture, school-age children are industrious. They busily master whatever skills their culture values. Physical and cognitive maturation, described in the previous chapters, makes such activity possible.

industry versus inferiority The fourth of Erikson's eight psychosocial crises, during which children attempt to master many skills, developing a sense of themselves as either industrious or inferior, competent or incompetent.

latency Freud's term for middle childhood, during which children's emotional drives and psychosexual needs are quiet (latent). Freud thought that sexual conflicts from earlier stages are only temporarily submerged, bursting forth again at puberty.

Erikson's Insights

With regard to his fourth psychosocial crisis, **industry versus inferiority,** Erikson noted that the child "must forget past hopes and wishes, while his exuberant imagination is tamed and harnessed to the laws of impersonal things," becoming "ready to apply himself to given skills and tasks" (Erikson, 1963, pp. 258, 259).

Think of learning to read and add, both of which are painstaking and boring. For instance, slowly sounding out "Jane has a dog" or writing "3 + 4 = 7" for the hundredth time is not exciting. Yet school-age children busily practice reading and math: They are intrinsically motivated to read a page, finish a worksheet, memorize a spelling word, color a map, and so on.

This was apparent in Chapter 12, in the comparison of mothers from Taiwan and New England. When Tim's mother helped him figure out how to do a particular kind of math problem that had him "clumsy" in class, she wrote out a page of problems for him, and then he did "the whole thing likety-split . . . [which made him] very happy" (Li et al., 2014, p. 1218). Similarly, children enjoy collecting, categorizing, and counting whatever they gather—perhaps stamps, stickers, stones, or seashells. That is industry.

Overall, children judge themselves as either *industrious* or *inferior*—deciding whether they are competent or incompetent, productive or useless, winners or losers. Self-pride depends not necessarily on actual accomplishments, but on how others, especially peers, view one's accomplishments. Social rejection is both a cause and a consequence of feeling inferior (Rubin et al., 2013).

Freud on Latency

Sigmund Freud described this period as **latency,** a time when emotional

at about this time

Signs of Psychosocial Maturation over the Years of Middle Childhood*

Children responsibly perform specific chores.
Children make decisions about a weekly allowance.
Children can tell time, and they have set times for various activities.
Children have homework, including some assignments over several days.
Children are less often punished than when they were younger.
Children try to conform to peers in clothes, language, and so on.
Children voice preferences about their after-school care, lessons, and activities.
Children are responsible for younger children, pets, and, in some places, work.
Children strive for independence from parents.

*Of course, culture is crucial. For example, giving a child an allowance has been typical for middle-class families in developed nations since about 1960. It was rare, or completely absent, in earlier times and other places.



drives are quiet (latent) and unconscious sexual conflicts are submerged. Some experts complain that "middle childhood has been neglected at least since Freud relegated these years to the status of an uninteresting 'latency period'" (Huston & Ripke, 2006, p. 7).

But in one sense, Freud was correct: Sexual impulses are absent, or at least hidden. Even when children were betrothed before age 12 (rare today but common earlier in some nations), the young husband and wife had little interaction.

Everywhere, boys and girls typically choose to be with others of their own sex. Indeed, boys who write "Girls stay out!" and girls who complain that "Boys stink!" are typical. From a developmental perspective, latency is a dynamic stage, not a gradual progression, as children shift away from sexual interests—only to reverse themselves when the hormones of puberty push them to do so (Knight, 2014).

Self-Concept

As children mature, they develop their *self-concept*, which is their idea about themselves, including their intelligence, personality, abilities, gender, and ethnic background. Self-concept begins earlier. As you remember, the very notion that they are individuals is a discovery in toddlerhood, and a positive, global self-concept is typical in early childhood. Complexity appears in middle childhood.

The self-concept gradually becomes more specific and logical, as cognitive development and social awareness increase. Children realize they are not the fastest, smartest, prettiest person. At some point between ages 6 and 11 when they win a race with their mother, they realize that she could have run faster if she had tried.

Crucial during middle childhood is **social comparison**—comparing one's self to others (Davis-Kean et al., 2009; Dweck, 2013). Ideally, social comparison helps school-age children value themselves and abandon the imaginary, rosy self-evaluation of preschoolers. The self-concept becomes more realistic, incorporating comparison to peers and judgments from the overall society (Davis-Kean et al., 2009).

social comparison The tendency to assess one's abilities, achievements, social status, and other attributes by measuring them against those of other people, especially one's peers.

This means that some children—especially those from minority ethnic or religious groups—become newly aware of social prejudices they need to overcome. Children also become aware of gender discrimination, with girls complaining that they are not allowed to play tougher sports and boys complaining that teachers favor the girls (Brown et al., 2011). Over the years of middle childhood, children most likely to develop healthy self-esteem are those who recognize prejudice and react by affirming pride in their backgrounds (Corenblum, 2014).

Affirming pride is an important counterbalance, because, for all children, their increasing self-understanding and social awareness come at a price. Self-criticism and self-consciousness rise from ages 6 to 11, and "by middle childhood this [earlier] overestimate of their ability or judgments decreases" (Davis-Kean et al., 2009, p. 184) while global self-esteem falls. Children's self-concept becomes influenced by the opinions of others, even by other children whom they do not know (Thomaes et al., 2010).

In addition, because children think concretely during middle childhood, materialism increases, and attributes that adults might find superficial (hair texture, sock patterns) become important, making self-esteem fragile (Chaplin & John, 2007). Insecure 10-year-olds might desperately want the latest jackets, cell phones, and so on.

Culture and Self-Esteem

Academic and social competence are aided by realistic self-perception. Unrealistically high self-esteem reduces effortful control (deliberately modifying one's

impulses and emotions), and less effortful control leads to lower achievement and increased aggression.

The same consequences occur if self-esteem is unrealistically low. Obviously then, the goal is to find a middle ground. This is not easy: Children may be too self-critical or not self-critical enough. Cultures differ in defining what that the middle ground is.





Same Situation, Far Apart: Helping at Home Sichuan, in China, and Virginia, in the United States, provide vastly different contexts for child development. For instance in some American suburbs, laws require recycling and forbid hanging laundry outside—but not in rural China. Nonetheless, everywhere children help their families with household chores, as these two do.

High self-esteem is not universally valued. Many cultures expect children to be modest, not prideful. For example, Australians say that "tall poppies are cut down," the Chinese say "the nail that sticks up is hammered," and the Japanese discourage social comparison aimed at making oneself feel superior. This makes self-esteem a moral issue: *Should* people believe that they are better than other people, as is typical in the United States? Answers vary (Robins et al., 2012; Buhrmester et al., 2011).

Often in the United States, children's successes are praised and teachers are wary of being critical, especially in middle childhood. For example, some schools issue report cards with grades ranging from "Excellent" to "Needs improvement" instead of from A to F. An opposite trend is found in the national reforms of education, explained in Chapter 12. Because of the No Child Left Behind Act, some schools are rated as failing. Obviously culture, cohort, and age all influence attitudes about high self-esteem: The effects are debatable.

One component of self-concept has received considerable research attention (Dweck, 2013). As children become more self-aware, they benefit from praise for their process, not for their person: for *how* they learn, *how* they relate to others, and so on, not for static qualities such as intelligence and popularity. This encourages growth.

For example, children who fail a test are devastated if failure means they are not smart. However, process-oriented children consider failure a "learning opportunity," a time to figure out how to study the next time. The self-conscious emotions (pride, shame, guilt) develop during middle childhood, and serve to guide social interaction. However, those same emotions can overcome a child's self-concept, leading to psychopathology (Muris & Meesters, 2014).

LaunchPad

Watch **Video: Interview with Carol Dweck** to learn about how children's mindsets affect their intellectual development.

Thus, as with most developmental advances, the potential for psychological growth is evident in the advance a child makes in self-concept in middle childhood. However, improvement is not automatic—family, culture, and social context affect whether this advance will be a burden or a blessing.

Resilience and Stress

In infancy and early childhood, children depend on their immediate families for food, learning, and life itself. Then "experiences in middle childhood can sustain, magnify, or reverse the advantages or disadvantages that children acquire in the preschool years" (Huston & Ripke, 2006, p. 2). Some children continue to benefit from supportive families, and others escape destructive family influences by finding their own niche in the larger world.

Surprisingly, some children seem unscathed by early experiences. They have been called "resilient" or even "invincible." Current thinking about resilience (see Table 13.1), with insights from dynamic-systems theory, emphasizes that no one is impervious to past history or current context, and many suffer lifelong harm from early maltreatment, but some weather early storms and a few not only survive but come out stronger (Masten, 2014).

Differential susceptibility is apparent, not only because of genes but also because of early child rearing, preschool education, and sociocultural values. As Chapter 1 explains, some children are hardy, more like dandelions than orchids, but all are influenced by their situation (Ellis & Boyce, 2008).

Resilience has been defined as "a dynamic process encompassing positive adaptation within the context of significant adversity" (Luthar et al., 2000, p. 543) and "the capacity of a dynamic system to adapt successfully to disturbances that

resilience The capacity to adapt well to significant adversity and to overcome serious stress.

Table 13.1 Dominant Ideas About Resilience, 1965–Present

1965	All children have the same needs for healthy development.
1970	Some conditions or circumstances—such as "absent father," "teenage mother," "working mom," and "day care"—are harmful for every child.
1975	All children are *not* the same. Some children are resilient, coping easily with stressors that cause harm in other children.
1980	Nothing inevitably causes harm. All the factors thought to be risks in 1970 (e.g., day care) are sometimes beneficial.
1985	Factors beyond the family, both in the child (low birthweight, prenatal alcohol exposure, aggressive temperament) and in the community (poverty, violence), can harm children.
1990	Risk–benefit analysis finds that some children are "invulnerable" to, or even benefit from, circumstances that destroy others.
1995	No child is invincibly resilient. Risks are always harmful—if not in education, then in emotions; if not immediately, then long term.
2000	Risk–benefit analysis involves the interplay among many biological, cognitive, and social factors, some within the child (genes, disability, temperament), the family (function as well as structure), and the community (including neighborhood, school, church, and culture).
2005	Focus on strengths, not risks. Assets in child (intelligence, personality), family (secure attachment, warmth), community (schools, after-school programs), and nation (income support, health care) are crucial.
2010	Strengths vary by culture and national values. Both universal needs and local variations must be recognized and respected.
2012	Genes, family structures, and cultural practices can be either strengths or weaknesses. Differential sensitivity means identical stressors can benefit one child and harm another.
2014	All children have the capacity to grow despite many impediments, a phenomenon called "ordinary magic." However multiple, accumulated stresses, such as usually occur when a child is poor and homeless, make resilience difficult.

threaten system function, viability, or development" (Masten, 2014, p. 10). Note that both leading researchers emphasize three factors in their definitions:

- Resilience is *dynamic*, not a stable trait. That means a given person may be resilient at some periods but not at others, and the effects from one period reverberate as time goes on.
- Resilience is a *positive adaptation* to stress. For example, if parental rejection leads a child to a closer relationship with another adult, that is positive adaptation, not mere passive endurance. That child is resilient.
- Adversity must be *significant*, a threat to the processes of development or even to life itself (viability).

Cumulative Stress

One important discovery is that stress accumulates over time, including stressful minor disturbances (called "daily hassles"). A long string of hassles, day after day, is more devastating than an isolated major stress. Almost every child can withstand one trauma, but repeated stresses make resilience difficult; "the likelihood of problems increased as the number of risk factors increased" (Masten, 2014, p. 14; Jaffee et al., 2007).

One international example comes from Sri Lanka, where many children in the first decade of the twenty-first century were exposed to war, a tsunami, poverty, deaths of relatives, and relocation. A study of the Sri Lankan children found that accumulated stresses, more than any single problem, increased pathology and decreased academic achievement. The authors point to "the importance of multiple contextual, past, and current factors in influencing children's adaptation" (Catani et al., 2010, p. 1188).

The social context—especially supportive adults who do not blame the child—is crucial. A chilling example comes from the "child soldiers" in the 1991–2002 civil war in Sierra Leone (Betancourt et al., 2013). Children witnessed and often participated in murder, rape, and other traumas. When the war was over, 529 war-affected youth, then aged 10 to 17, were interviewed. Many were pathologically depressed or anxious, as one might expect.

These war-damaged children were interviewed again two and six years later. Surprisingly, many had overcome their trauma and were functioning normally. Recovery was more likely if they were in middle childhood, not adolescence, when the war occurred. If at least one caregiver survived, if their communities did not reject them, and if their daily routines were restored, the children usually regained emotional normality.



AAMIR QURESHI/AFP/GETTY IMAGES

Death and Disruption Children are astonishingly resilient. This girl is in a refugee camp in Northern Syria in 2013, having fled the civil war that killed thousands in her community. Nonetheless, she is with her family and is adequately fed and clothed, and that is enough for a smile.

An example from the United States comes from children temporarily living in a shelter for homeless families. (Cutuli et al., 2013; Obradović, 2012). Compared to other children from the same kinds of families (typically high poverty, often single parent), they are "significantly behind their low-income, but residentially more stable peers" in every measure of development (Obradović et al., 2009, p. 513). Presumably the residential disruption, when added to their other stresses, was too much. They suffered physiologically, as measured by cortisol levels, blood pressure, and weight; they also suffered psychologically, as measured by learning in school and number of good friends.

Again, protective factors buffered the impact: Having a parent with them who was supportive and who provided affection, hope, and stable routines enabled some homeless children to be resilient.

This echoes research from England during World War II, when many children were sent to loving families in rural areas to escape

the daily bombing of London. To the surprise of the researchers, those children who stayed in London, hearing bombs and frequently fleeing to air raid shelters, were more resilient than those who were physically safe but had no parent nearby (Freud & Burlingham, 1943).

Similar results were found in a longitudinal study of children exposed to a sudden, wide-ranging, terrifying wild fire in Australia. Almost all the children suffered stress reactions at the time, but 20 years later, the crucial factor in their reactions was not how close they had been to the blaze but whether or not they were separated from their mothers (McFarlane & Van Hooff, 2009).

Cognitive Coping

Obviously, these examples are extreme, but the general finding appears in other research as well. Disasters take a toll, but resilience is possible. Factors in the child (especially problem-solving ability), in the family (consistency and care), and in the community (good schools and welcoming religious institutions) all help children recover (Masten, 2014).

One pivotal factor is the child's own interpretation of events (Lagattuta, 2014). Cortisol increases in low-income children *if* they interpret events connected to their family's poverty as a personal threat and *if* the family lacks order and routines (thus increasing daily hassles) (E. Chen et al., 2010). When low-SES children do not take things personally and their family is not chaotic, they may be resilient.

Think of people you know: Many adults whose childhood family income was low did not consider themselves poor. They may have had to share a bed with a sibling, and they may have eaten macaroni day after day, but that did not bother them because their parents seemed strong and happy, or at least not erratic and angry. They did not realize how poor they were. Therefore, poverty did not harm them lifelong.

In general, a child's interpretation of a family situation (poverty, divorce, and so on) determines how it affects him or her. Some children consider the family they were born into a temporary hardship; they look forward to the day when they can leave childhood behind. If they also have personal strengths, such as problem-solving abilities and intellectual openness, they may shine in adulthood—evident in the United States in thousands of success stories, from Abraham Lincoln to Oprah Winfrey.

The opposite reaction is called *parentification*, when children feel responsible for the entire family, acting as parents who take care of everyone, including their actual parents. Here again, the child's interpretation is crucial.

If children feel burdened and wish they could have a carefree childhood, they are likely to suffer, but if they think they are helpful and their parents and community respect their contribution, they are likely to be resilient. This may explain a curious finding: European American children are more likely to suffer from parentification than African Americans are (Khafi et al., 2014).

In another example, children who endured hurricane Katrina were affected by their thoughts, positive and negative, more than by other expected factors, including their caregivers' distress (Kilmer & Gil-Rivas, 2010). Especially in disasters, getting school routines started again quickly is sometimes especially helpful because children benefit from their cognitive accomplishments and the expectations for their future. Spiritual convictions and restoring religious routines (prayer, attending services) also help children cope if they provide hope and meaning (Masten, 2014).

Prayer may also foster resilience, because it changes a person's thinking. In one study, adults were required to pray for a specific person for several weeks. Their attitude about that person changed (Lambert et al., 2010). Ethics precludes such an

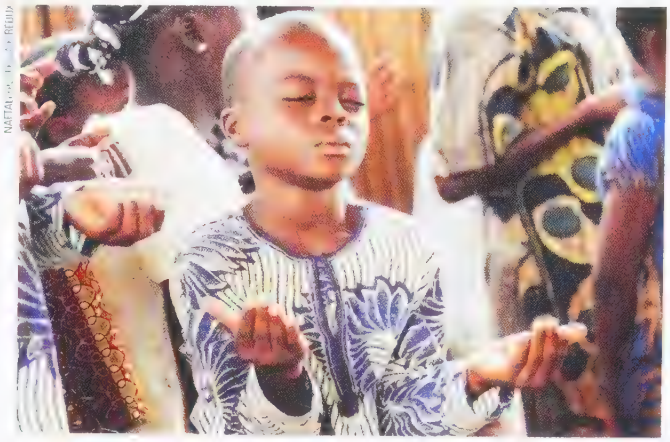
LaunchPad



COURTESY UNICEF

Video Activity: Child Soldiers and Child Peacemakers examines the state of child soldiers in the world, and then explores how developmental components of adolescent cognition relate to the decisions of five teenage peace activists.





Same Situation, Far Apart: Praying Hands Differences are obvious between the Northern Indian girls entering their Hindu school and the West African boy in a Christian church, even in their clothes and hand positions. But underlying similarities are more important. In every culture, many 8-year-olds are more devout than their elders.

experiment with children, but it is known that children often pray, expecting that prayer will make them feel better, especially when they are sad or angry (Bamford & Lagattuta, 2010). As already explained, expectations and interpretations can be powerful.

SUMMING UP Children advance in maturity and responsibility during the school years. According to Erikson, the crisis of industry versus inferiority generates feelings of confidence or self-doubt as children try to accomplish whatever their family, school, and culture expect them to do. Freud thought latency enables children to master new skills because sexual impulses are quiet.

Often children develop more realistic self-concepts, with the help of their families and their own attitudes, as social comparison becomes more possible. Some children are resilient, coping with major adversity including war and natural disasters. Resilience is more likely if the stress is temporary and coping measures and social support are available. School achievement, helpful adults, stable routines, and religious beliefs help many children overcome whatever problems they face.

WHAT HAVE YOU LEARNED?

1. How do Erikson's stages for preschool and school-age children differ?
2. Why is social comparison particularly powerful during middle childhood?
3. Why do cultures differ in how they value pride or modesty?
4. Why and when might minor stresses be more harmful than major stresses?
5. What factors in the social context help children cope with major disasters?
6. How might a child's interpretation affect the ability to cope with repeated stress?

Families and Children

No one doubts that genes affect personality as well as ability, that peers are vital, and that schools and cultures influence what, and how much, children learn. Some have gone farther, suggesting that genes, peers, and communities have so much influence that parenting has little impact—unless it is grossly abusive (Harris, 1998, 2002; McLeod et al., 2007). This suggestion arose from studies about the impact of the environment on child development.

Shared and Nonshared Environments

Many studies have found that children are much less affected by *shared environment* (influences that arise from being in the same environment, such as two siblings living in one home, raised by their parents) than by *nonshared environment*

(e.g., the experiences in the school or neighborhood that differ between one child and another).

Most personality traits and intellectual characteristics can be traced to genes and nonshared environments, with little left over for the shared influence of being raised together. Even psychopathology, happiness, and sexual orientation (Burt, 2009; Långström et al., 2010; Bartels et al., 2013) arise primarily from genes and nonshared environment.

Since many research studies find that shared environment has little impact, could it be that parents are merely caretakers, necessary for providing basics (food, shelter), harmful when abusive, but inconsequential in their daily restrictions, routines, and responses? Could it be that it doesn't matter much if parents enforce a set bath and bedtime, or if the parents let the child wash and sleep when he wishes? If a child becomes a murderer or a hero, maybe that is genetic and non-shared, so we should not blame or credit the parents!

Recent findings, however, reassert parent power. The analysis of shared and nonshared influences was correct, but the conclusion was based on a false assumption. Siblings raised together do *not* share the same environment.

For example, if relocation, divorce, unemployment, or a new job occurs in a family, the impact on each child depends on the child's age, genes, resilience, and gender. Moving to another town upsets a school-age child more than an infant, divorce harms boys more than girls, poverty may hurt preschoolers the most, and so on.

The variations above do not apply for all siblings: Differential susceptibility means that one child is more affected, for better or worse, than another (Pluess & Belsky, 2010). When siblings are raised together, all experiencing the same dysfunctional family, each children's genes, age, and gender may lead one child to become antisocial, another to be pathologically anxious, and a third to be resilient, capable, and strong (Beauchaine et al., 2009). Further, parents do not treat each child the same, even when the children look identical, as the following makes clear.



RADIUS IMAGES/MASTERFILE

Family Unity Thinking about any family—even a happy, wealthy family like this one—makes it apparent that each child's family experiences differ. For instance, would you expect this 5-year-old boy to be treated the same way as his two older sisters? And how about each child's feelings toward the parents? Even though the 12-year-olds are twins, one may favor her mother while the other favors her father.

Especially for Scientists How would you determine whether or not parents treat all their children the same? (see response, page 418)

a view from science

"I Always Dressed One in Blue Stuff . . ."

To separate the effects of genes and environment, many researchers have studied twins. As you remember from Chapter 3, some twins are dizygotic, with only half of their genes in common, and some are monozygotic, identical in all their genes. It was assumed that children growing up with the same parents would have the same nurture, so that if dizygotic twins were less alike than monozygotic twins (and they often are), their differences must be genetic. However, if one monozygotic twin was unlike the other, that must be the result of nonshared environment (i.e., non-family influences).

That logical idea was the basis for research that found that genes and nonshared environment had a greater effect on twins than shared family environment, and, by extension, on everyone. Comparing monozygotic and dizygotic twins continues to be a useful research strategy. Recently it led to interesting conclusions about the interplay of nature and nurture in topics from food preferences of 3-year-olds (parents are influential in a child's taste in junk food, less so for fruits and vegetables) to 25-year-olds' relationships with their parents (genes are more influential in adulthood than in adolescence, when peers are more important) (Fildes et al., 2014; Samek et al., 2014).

However, those research conclusions are now tempered by another finding: Siblings raised in the same households do not necessarily share the same home environment. A seminal study in this regard occurred with twins in England.

An expert team of scientists compared 1,000 sets of monozygotic twins reared by their biological parents (Caspi et al., 2004). Obviously, the pairs were identical in genes, sex, and age. The researchers asked the mothers to describe each twin. Descriptions ranged from very positive ("my ray of sunshine") to very negative

("I wish I never had her. . . . She's a cow, I hate her") (quoted in Caspi et al., 2004, p. 153). Many mothers noted personality differences between their twins. For example, one mother said:

> Susan can be very sweet. She loves babies . . . she can be insecure . . . she flutters and dances around. . . . There's not much between her ears. . . . She's exceptionally vain, more so than Ann. Ann loves any game involving a ball, very sporty, climbs trees, very much a tomboy. One is a serious tomboy and one's a serious girlie girl. Even when they were babies I always dressed one in blue stuff and one in pink stuff.
>
> *[quoted in Caspi et al., 2004, p. 156]*

Some mothers rejected one twin but not the other:

> He was in the hospital and everyone was all "poor Jeff, poor Jeff" and I started thinking, "Well, what about me? I'm the one's just had twins. I'm the one's going through this, he's a seven-week-old baby and doesn't know a thing about it . . ." I sort of detached and plowed my emotions into Mike. [Jeff's twin brother.]
>
> *[quoted in Caspi et al., 2004, p. 156]*

This mother later blamed Jeff for favoring his father: "Jeff would do anything for Don but he wouldn't for me, and no matter what I did for either of them [Don or Jeff] it wouldn't be right" (p. 157). She said Mike was much more lovable.

The researchers measured personality at age 5 (assessing, among other things, antisocial behavior as reported by kindergarten teachers) and then measured each twin's personality two years later. They found that if a mother was more negative toward one of her twins, that twin *became* more antisocial, more likely to fight, steal, and hurt others at age 7 than at age 5, unlike the favored twin.

These researchers acknowledge that many other nonshared factors—peers, teachers, and so on—are significant. But this personality difference in monozygotic twins confirms that parents matter. This will surprise no one who has a brother or a sister. Children from the same family do not always share the same family experience.

Family Structure and Family Function

family structure The legal and genetic relationships among relatives; includes nuclear family, extended family, stepfamily, and so on.

family function The way a family works to meet the needs of its members. Children need families to provide basic material necessities, to encourage learning, to help them develop self-respect, to nurture friendships, and to foster harmony and stability.

- **Family structure** refers to the legal and genetic connections among related people. Legal connections may be marriage or adoption; genetic connections may be from parent to child, or more broadly as between cousins, or grandparents and grandchildren, or even between great aunts and second cousins.

Family function refers to how the people in a family care for each other: Some families function well, others are dysfunctional.

Function is more important than structure; everyone needs family love and encouragement, which can come from parents, grandparents, siblings, or any other relative. Beyond that, people's needs differ depending on how old they are: Infants need responsive caregiving, teenagers need guidance, young adults need freedom, the aged need respect.

The Needs of Children in Middle Childhood

What do school-age children need? Ideally, their families provide five things:

1. *Physical necessities.* Although 6- to 11-year-olds eat, dress, and go to sleep without help, families provide food, clothing, and shelter. Ideally, children live in a household where adults meet their basic needs.
2. *Learning.* These are prime learning years: Families support, encourage, and guide education.
3. *Self-respect.* Because children at about age 6 become much more self-critical and socially aware, families provide opportunities for success (in academic pursuits, in sports, in the arts, or whatever).
4. *Peer relationships.* Families choose schools and neighborhoods with friendly children and then arrange play dates, group activities, overnights, and so on.
5. *Harmony and stability.* Families provide protective, predictable routines in a home that is a safe, peaceful haven.

Response for Scientists (from page 417): Proof is very difficult when human interaction is the subject of investigation, since random assignment is impossible. Ideally, researchers would find identical twins being raised together and would then observe the parents' behavior over the years.

The final item on the list above is especially crucial in middle childhood: Children cherish safety and stability, they do not like change (Turner et al., 2012). Ironically, many parents move from one neighborhood or school to another during these years. Children who move frequently are significantly harmed, academically and psychologically, but resilience is possible (Cutuli et al., 2013).

The problems arising from instability are evident for U.S. children in military families. Enlisted parents tend to have higher incomes, better health care, and more education than do civilians from the same backgrounds. But they have one major disadvantage: They move.

Military children have more emotional problems and lower school achievement than do their peers from civilian families. In reviewing earlier research, a scientist reports "[m]ilitary parents are continually leaving, returning, leaving again. . . school work suffers, more for boys than for girls, . . .and that reports of depression and behavioral problems go up when a parent is deployed" (Hall, 2008, p. 52).

About half the military personnel on active duty have children, and many of their children learn to cope with the stresses they experience (Russo & Fallon, 2014). To help them, the U.S. military has instituted special programs to help children whose parents are deployed. Caregivers of such children are encouraged to avoid changes in the child's life: no new homes, new rules, or new schools (Lester et al., 2011). Similar concerns arise when a deployed parent comes home: He or she is welcomed, of course, but sometimes return signifies changes in the child's life, and that is difficult.

On a broader level, children who are repeatedly displaced because of storms, fire, war, and the like are particularly likely to suffer in middle childhood. At this age, many children try to protect their parents by not telling them how distressed they are, but the data reveal that moving from place to place impairs a child's health and school learning (Masten, 2014).

Diverse Structures

Worldwide today, there are more single-parent households, more divorces and remarriages, and fewer children per family than in the past (see Visualizing Development, p. 423). The specifics vary from decade to decade and nation to nation (see Figure 13.1). Nevertheless, although the proportions differ, the problems are similar worldwide.

Such diversity should be acknowledged but not exaggerated. Almost two-thirds of all U.S. school-age children live with two married parents (see Table 13.2), most often their biological parents. A **nuclear family** is a family composed only of children and their biological parents (married or not). Other two-parent structures include adoptive, foster, grandparents without parents, stepfamilies, and same-sex couples.

Rates of single-parenthood vary greatly worldwide. U.S. rates are among the highest, with about 31 percent of all U.S. 6- to 11-year olds living in a **single-parent family.** Rates change depending on the age of the child: More than half of all contemporary U.S. children will live in a single-parent family at least for a year before they reach age 18. However, as far as we can deduce, at any given moment most 6- to 11-year-olds live with two parents.

An **extended family** includes relatives in addition to parents and children. Usually the additional persons are grandparents, sometimes uncles, aunts, or cousins of the child.

The crucial distinction between types of families is based on who lives together in the same household. Many so-called single-parent families actually have two parents involved in the child's life. However, the two parents do not live together. Likewise, some children see their grandparents every day, even though they do not

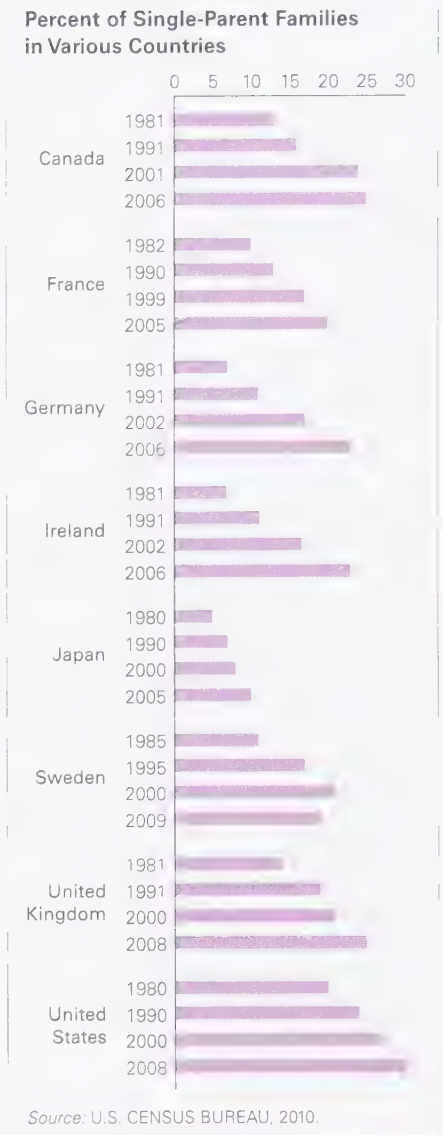


FIGURE 13.1

Single Parents A rising percentage of all households with children are headed by a single parent. In some countries, many households are headed by two unmarried parents, a structure not shown here. With the exception of Ireland, whose data are from family-based statistics, these data are from household-based statistics.

nuclear family A family that consists of a father, a mother, and their biological children under age 18.

single-parent family A family that consists of only one parent and his or her biological children under age 18.

extended family A family of three or more generations living in one household.

live with them. In that case, the family functions like an extended family, but it is not categorized as such.

polygamous family A family consisting of one man, several wives, and their children.

In many nations, the **polygamous family** (one husband with two or more wives) is an acceptable family structure. Generally in polygamous families, income per child is reduced, and education, especially for the girls, is limited (Omariba & Boyle, 2007). Polygamy is rare—and illegal—in the United States. Even in nations where it is allowed, polygamy is less common than it was 30 years ago. In Ghana, for example, men with several wives and a dozen children are now unusual (Heaton & Darkwah, 2011).

Family Structures (percent of U.S. 6- to 11-year-olds in each type)*

Two-Parent Families (69%)

1. **Nuclear family** (46%) Named after the nucleus (the tightly connected core particles of an atom), the nuclear family consists of a man and a woman and their biological offspring under 18 years of age. In middle childhood, almost half of all children live in nuclear families.
2. **Extended family** (10%) If both biological parents are present and other relatives live with them (usually a grandparent, sometimes an aunt or uncle), that is an extended family. About 10 percent of school-age children live in such families.
3. **Stepparent family** (9%) Divorced fathers usually remarry; divorced mothers remarry about half the time. When children from a former relationship live with the new couple, it makes a stepparent family. If the stepparent family includes children born to two or more couples (such as children from the spouses' previous marriages and/or children of the new couple), that is called a *blended family*.
4. **Adoptive family** (2%) Although as many as one-third of infertile couples adopt children, few adoptable children are available, so most adoptive couples have only one or two children. Thus, only 2 percent of children are adopted, although the overall percentage of adoptive families is higher than that.
5. **Both grandparents, no parents** (1%) Grandparents take on parenting for some children when biological parents are absent (dead, imprisoned, sick, addicted, etc.).
6. **Two same-sex parents** (1%) Some two-parent families are headed by a same-sex couple, with the biological child of one of them. (When same-sex couples adopt a child, that is listed as an adoptive family, above.)

Single-Parent Families (31%)

One-parent families are increasing, but they average fewer children than two-parent families. So in middle childhood, only 31 percent of children have a lone parent.

1. **Single mother—never married** (14%) More than half of all U. S. women under age 30 who gave birth in 2010 or later were unmarried. However, by the time their children reach middle childhood, often the mothers have married or the children are cared for by someone else. At any given moment, about 13 percent of 6- to 11-year-olds are with their never-married mothers.
2. **Single mother—divorced, separated, or widowed** (12%) Although many marriages end in divorce (almost half in the United States, fewer in other nations), many divorcing couples have no children. Others remarry. Thus, only 12 percent of school-age children currently live with single, formerly married mothers.
3. **Single father** (4%) About 1 father in 25 has physical custody of his children and raises them without their mother or a new wife. This category increased at the start of the twenty-first century but has decreased since 2005.
4. **Grandparent alone** (1%) Sometimes a single grandparent (usually the grandmother) becomes the sole caregiving adult for a child.

*Less than 1 percent of U.S. children live without any caregiving adult; they are not included in this table.

Source: The percentages in this table are estimates, based on data in U.S. Census Bureau, *Statistical Abstract* and Current Population Reports, *America's Families and Living Arrangements;* and Pew Research Center reports. The category "extended family" in this table is higher than in most published statistics, since some families do not tell official authorities about relatives living with them.

a view from science

Divorce

Scientists try to provide analysis and insight based on empirical data (of course), but the task goes far beyond reporting facts. Regarding divorce, thousands of studies and several opposing opinions need to be considered, analyzed, and combined—no easy task. One scholar who has attempted this analysis is Andrew Cherlin, who has written 13 books and over 200 articles since 1988.

Among the facts that need analysis are these:

1. The United States leads the world in the rates of marriage, divorce, and remarriage, with almost half of all marriages ending in divorce.
2. Single parents, cohabiting parents, and stepparents sometimes provide good care, but children tend to do best in nuclear families with married parents.
3. Divorce often impairs children's academic achievement and psychosocial development for years, even decades.

Each of these is troubling. Why does this occur? The problem, Cherlin (2009) contends, is that U.S. culture is conflicted: Marriage is idolized, but so is personal freedom. As a result, many people assert their independence by marrying without consulting their parents or community. Then, child care often becomes overwhelming and family support is lacking.

Because the United States does not provide paid parental leave or public child care, marriages become strained. Divorce seems to be the solution. However, because marriage remains the ideal, divorced adults blame their former mate or their own poor decisions, not the institution or the society.

Consequently, they seek another marriage, which may lead to another divorce. (Divorced people are more likely to remarry than single people their age are to marry, but second marriages fail more often than first marriages.) Repeated transitions allow personal freedom for the adults but harm the children.

This leads to a related insight. Cherlin suggests that the main reason children are harmed by divorce—as well as by cohabitation, single parenthood, and stepparenthood—is not the legal status of their parents but the lack of stability. For example, divorces typically include numerous disruptions: in residence, in school, in family members, and—this may be crucial—in the relationship between child and parent. Divorced parents may become too strict or too lenient, impose premature responsibility or independence, or trouble the child by sharing confidences that relieve the adult's anger or loneliness.

Scholars now describe divorce as a process, with transitions and conflicts before and after the formal event (H. S. Kim, 2011; Putnam, 2011). As you remember, resilience is difficult when the child must contend with repeated changes and ongoing hassles—yet that is what divorce brings. Coping is particularly hard when children are at an age that involves their own developmental transition, such as entering first grade or beginning puberty.



Didn't Want to Marry This couple were happily cohabiting and strongly committed to each other but didn't wed until they learned that her health insurance would not cover him unless they were legally married.

Beyond analysis and insight, the other task of developmental science is to provide practical suggestions. Most scholars would agree with the following:

1. Marriage commitments need to be made slowly and carefully, to minimize the risk of divorce. It takes time to develop intimacy and commitment.
2. Once married, couples must work to keep the relationship strong. Often happiness dips after the birth of the first child. New parents need to do together what they love—dancing, traveling, praying, whatever.
3. Divorcing parents need to minimize transitions and maintain a child's relationships with both parents. A mediator—who advocates for the child, not for either parent—may help.
4. In middle childhood, schools can provide vital support. Routines, friendships, and academic success may be especially crucial when a child's family is chaotic.

This may sound idealistic. However, another scientist, who has also studied divorced families for decades, writes:

> Although divorce leads to an increase in stressful life events, such as poverty, psychological and health problems in parents, and inept parenting, it also may be associated with escape from conflict, the building of new more harmonious fulfilling relationships, and the opportunity for personal growth and individuation.
>
> (*Hetherington, 2006, p. 204*)

Not every parent should marry, not every marriage should continue, and divorce does not harm every child. However, every child benefits if families fulfill all five needs of school-age children. Scientists hope they will.

Connecting Family Structure and Function

How a family functions is more important for the children than the structure of their family. That does not make structure irrelevant. The two are related; structure influences—but does not determine—function. The crucial question is whether the structure makes it more or less likely that the five family functions mentioned earlier (physical necessities, learning, self-respect, friendship, and harmony/stability) will be fulfilled.

Two-Parent Families

On average, nuclear families function best; children in the nuclear structure tend to achieve better in school with fewer psychological problems. A scholar who summarized dozens of studies concludes: "Children living with two biological married parents experience better educational, social, cognitive, and behavioral outcomes than do other children" (Brown, 2010, p. 1062). Why? Does this mean that everyone should marry before they have a child, and then stay married? Not necessarily. The case for nuclear families is not as strong as it appears. Some benefits are correlates, not causes.



AP PHOTO/CHARLES REX ARBOGAST



GETTY IMAGES

Same Situation, Far Apart: Happy Families The boys in both photos are about 4 years old. Roberto (*left*) lives with his single mother in Chicago. She pays $360 a month for her two children to attend a day-care center. The youngest child in the Balmedina family (*right*) lives with his nuclear family—no day care needed—in the Philippines. Which boy has the better life? The answer is not known; family function is more crucial than family structure.

Education, earning potential, and emotional maturity all make it more likely that people will marry, have children, stay married, and establish a nuclear family. For example, first-time mothers in the United States are usually married when they conceive their first child if they are highly educated (78 percent), but usually not married if they are low in SES (89 percent unmarried at conception) (Gibson-Davis & Rackin, 2014).

Thus, brides and grooms may have personal assets *before* they marry and become parents. That means that the correlation between child success and married parents occurs partly because of who marries, not because of the wedding. For some unmarried mothers, making a legal, binding commitment would actually render them less able to devote the attention and love that their child needs.

Income also correlates with family structure. Usually, if everyone can afford it, relatives live independently, apart from the married couple. That means that, at least in the United States, an extended family suggests that someone is financially dependent.

VISUALIZING DEVELOPMENT

A Wedding, or Not? Family Structures Around the World

Children fare best when both parents actively care for them every day. This is most likely to occur if the parents are married, although there are many exceptions. Many developmentalists now focus on the rate of single parenthood, shown on this map. Some single parents raise children well, but the risk of neglect, poverty, and instability in single-parent households increases the chances of child problems.

RATES OF SINGLE PARENTHOOD

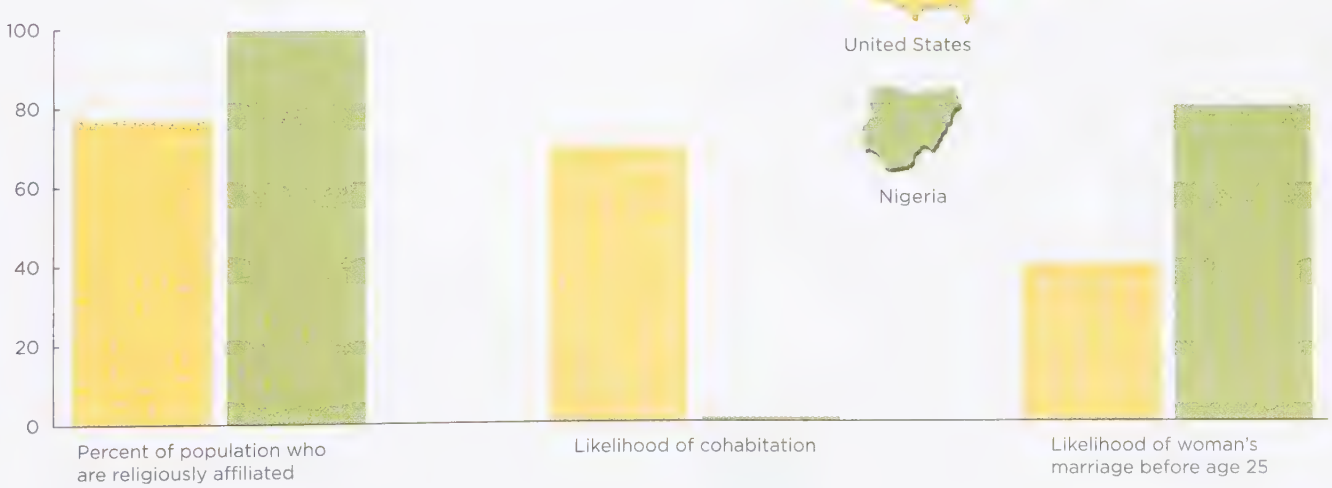


The circled numbers represent the percentage of children living in single-parent households.

DATA FROM WILCOX, 2011

A young couple in love and committed to each other—

what next?



DATA FROM COPE N ET AL., 2013 AND U.S. CENSUS BUREAU, 2012

Cohabitation and marriage rates change from year to year and from culture to culture. These two examples are illustrative and approximate. Family-structure statistics like these often focus on marital status and may make it seem as if Nigerian children are more fortunate than American children. However, actual household functioning is more complex than that, and involves many other factors.

These two factors—mate selection and income—explain some of the correlation between nuclear families and child well-being, but not all of it (Brown, 2010). The fact that the nuclear family is "not as strong as it appears" does not mean that marriage does not matter. For many couples, marriage leads to mutual affection and support, and then both partners become wealthier and healthier than either would alone. Further, when both parents live with their children day and night, a *parental alliance* is likely to form and benefit the child.

The parental alliance is important in every nation, but its influence is particularly apparent in Russia, where recent economic upheaval has reduced the male average life span from age 64 in 1985 to 59 in 2000. Those most at risk for a premature death are single men, who have higher rates of depression and alcoholism. The husband/father role leads men to take better care of themselves, so they can care for their children (Ashwin & Isupova, 2014). (**Developmental Link:** The parental alliance was first discussed in Chapter 4.)

Shared parenting also decreases the risk of child maltreatment and makes it more likely that children will have someone to read to them, check their homework, invite their friends over, buy them new clothes, and save for their education. Of course, having two married parents does not guarantee an alliance. One of my students wrote:

> My mother externalized her feelings with outbursts of rage, lashing out and breaking things, while my father internalized his feelings by withdrawing, being silent and looking the other way. One could say I was being raised by bipolar parents. Growing up, I would describe my mom as the Tasmanian devil and my father as the ostrich, with his head in the sand. . . . My mother disciplined with corporal punishment as well as with psychological control, while my father was permissive. What a pair.
>
> (C. Zola)

This student never experienced a well-functioning parental alliance. That may help explain why she is now a single parent, having twice married, given birth, and divorced. More generally, childhood family experiences echo in adulthood. Fathers who live apart from the mothers of their children tend to be most involved when the children are young. Later, their former partners and the children themselves make meaningful relationships difficult, so divorced fathers increasingly distance themselves from their children as time goes on.

One consequence: When children reach "the age of majority" (usually 18) and fathers are no longer legally responsible for their children, many divorced or unmarried fathers stop child support. Unfortunately, most emerging adults need substantial funds if they want to attend college or live independently, so a long-ago divorce still hinders their development (Goldfarb, 2014).

The lack of financial support for older adolescents is not simply because two-parent families are wealthier than one-parent families. Even remarried adults, whose household income is comparable to that of nuclear parents, contribute less, on average, to children from their first marriage (Turley & Desmond, 2011).

Stepfathers tend to spend very little time caring for their stepchildren, even when they live together (Kalil et al., 2014). When they grow up, their children are more likely to live farther from either father than children from nuclear families are (Seltzer et al., 2013). The parental alliance is weaker in such families in childhood, and that becomes a weaker family alliance lifelong.



DAVID MAXWELL/THE NEW YORK TIMES/REDUX

Middle American Family This photo seems to show a typical breakfast in Brunswick, Ohio—Cheerios for 1-year-old Carson, pancakes that 7-year-old Carter does not finish eating, and family photos crowded on the far table. The one apparent difference—that both parents are women—does not necessarily create or avoid children's problems.

Adoptive and same-sex parents usually function well for children, not only in middle childhood but lifelong. Stepfamilies can also function well, if the biological parent has chosen a new partner who will be a good parent. Especially when children are under age 2 and the stepparent and the biological parent develop a strong, healthy relationship, the children who live with them may thrive (Ganong et al., 2011). Of course, no structure always functions well, but particular circumstances for all three family types can nudge in the right direction.

All three family types (step-, adoptive, and same-sex) risk instability, so children may not have the fifth family function that they need (harmony and stability). Instability is particularly likely in stepfamilies. Compared with other two-parent families, stepfamilies often change residence and community. In addition, family constellations shift: Older stepchildren leave home more often than older biological children, new babies capture parental attention and affection, additional relatives may join the household, and divorce is more common.

Further, harmony is more difficult in stepfamilies (Martin-Uzzi, & Duval-Tsioles, 2013). Often the child's loyalty to both biological parents is challenged by ongoing disputes between them. A solid parental alliance is elusive when it includes three adults—two of whom had such profound differences that they divorced, plus another adult who is a newcomer to the child.

Children who gain a stepparent may be angry or sad; for both reasons, they often act out (for example, fight with friends, fail in school, refuse to follow household rules). That causes disagreements for their newly married parents, who often have opposite strategies for child-rearing.

Further, disputes between half-siblings in blended families are common. Remember, however, that structure affects function but does not determine it. Many stepparent families are difficult for children, but others function well for everyone (van Eeden-Moorefield & Pasley, 2013).

Finally, the grandparent family is often idealized, but reality is much more complex. If a household has grandparents and parents, often conflicts arise, and sometimes the grandparents are care-receivers more than caregivers. When grandparents provide full-time care with no parents present (called a *skipped-generation family*, a common form of foster care), the hope is that their experience and maturity will benefit the grandchildren.

But the grandparents usually do not benefit. On average, grandparents in skipped-generation families are poorer, sicker, and less stable than other grandparents. Rates of single parenthood are also higher, as many skipped-generation families are headed by the grandmother alone. To make matters worse, grandchildren who have been removed from their parents often have health or behavioral problems themselves (Hayslip et al., 2014). They are less likely to succeed in school or have supportive, enduring friendships.

Despite all these problems, skipped-generation families receive fewer services for children. Judges, schools, and social workers are sometimes ignorant of the special needs of such families, and where child care is concerned, neighbors and friends are less likely to help a grandmother than a mother (Baker & Mutchler, 2010; Hayslip & Smith, 2013).



Don't Judge We know this is a mother and her child, but structure and function could be wonderful or terrible. These two could be half of a nuclear family, or a single mother with one adoptive child, or part of four other family structures. That does not matter as much as family function: If this scene is typical, with both enjoying physical closeness in the great outdoors, this family functions well.

Single-Parent Families

On average, the single-adult structure functions less well for children because one adult has less income, time, and stability than two adults who share responsibility. Most single parents fill many roles—including wage earner, daughter or son (single parents often depend on their own parents), and lover (many seek a new partner), which diminishes their ability to provide steady emotional and academic support for their children.

Especially for Single Parents You have heard that children raised in one-parent families will have difficulty in establishing intimate relationships as adolescents and adults. What can you do about this possibility? (see response, page 427)

Rates of single parenthood and single grandparenthood are far higher among African Americans than other ethnic groups. This increases the neighborhood acceptance but does not lighten the burden. If a single parent is depressed (and many are), that compounds the problem. The following case is an example.



a case to study

How Hard Is It to Be a Kid?

Neesha's fourth-grade teacher referred her to the school guidance team because Neesha often fell asleep in class, was late 51 days, and was absent 15 days. Although she was only 10 years old and had missed much of the fourth grade, testing found Neesha scoring at the seventh-grade level in reading and writing, and at the fifth-grade level in math. Since achievement was not Neesha's problem, something psychosocial must be amiss.

The counselor spoke to Neesha's mother, Tanya, a depressed single parent who was worried about paying rent on the tiny apartment where she had moved when Neesha's father left three years earlier. He lived with his girlfriend, now with a new baby. Tanya said she had no problems with Neesha, who was "more like a little mother than a kid," unlike her 15-year-old son, Tyrone, who suffered from fetal alcohol effects and whose behavior worsened when his father left.

Tyrone was recently beaten up badly as part of a gang initiation, a group he considered "like a family." He was currently in juvenile detention, after being arrested for stealing bicycle parts. Note the nonshared environment here: Although the siblings grew up together, when their father left, 12-year-old Tyrone became rebellious whereas 7-year-old Neesha became parentified, "a little mother."

The school counselor spoke with Neesha.

> Neesha volunteered that she worried a lot about things and that sometimes when she worries she has a hard time falling asleep. . . . she got in trouble for being late so many times, but it was hard to wake up. Her mom was sleeping late because she was working more nights cleaning offices. . . . Neesha said she got so far behind that she just gave up. She was also having problems with the other girls in the class, who were starting to tease her about sleeping in class and not doing her work. She said they called her names like "Sleepy" and "Dummy." She said that at first it made her very sad, and then it made her very mad. That's when she started to hit them to make them stop.
>
> *[Wilmshurst, 2011, pp. 152–153]*

Neesha was coping with poverty, a depressed mother, an absent father, a delinquent brother, and classmate bullying. She seemed to have been resilient—her achievement scores were impressive—but shortly after the counselor spoke with her,

> The school principal received a call from Neesha's mother, who asked that her daughter not be sent home from school because she was going to kill herself. She was holding a loaded gun in her hand and she had to do it, because she was not going to make this month's rent. She could not take it any longer, but she did not want Neesha to come home and find her dead. . . . While the guidance counselor continued to keep the mother talking, the school contacted the police, who apprehended [the] mom while she was talking on her cell phone. . . . The loaded gun was on her lap. . . . The mother was taken to the local psychiatric facility.
>
> *[Wilmshurst, 2011, pp. 154–155]*

Whether Neesha will be able to cope with her problems depends on whether she can find support beyond her family. Perhaps the school counselor will help:

> When asked if she would like to meet with the school psychologist once in a while, just to talk about her worries, Neesha said she would like that very much. After she left the office, she turned and thanked the psychologist for working with her, and added, "You know, sometimes it's hard being a kid."
>
> *[Wilmshurst, 2011, p. 154]*

Family structure encourages or undercuts healthy function, but many parents and communities overcome structural problems to support their children. Contrary to the averages, thousands of nuclear families are destructive, thousands of stepparents provide excellent care, and thousands of single-parent families are wonderful. In some European nations, single parents are given many public resources; in other nations, they are shamed as well as unsupported. Children benefit or suffer accordingly (Abela & Walker, 2014).



Culture is always influential. In contrast to data from the United States, a study in the slums of Mumbai, India, found rates of psychological disorders among school-age children *higher* in nuclear families than in extended families, presumably because grandparents, aunts, and uncles provided more care and stability in that city than two parents alone (Patil et al., 2013). On the other hand, another student found that college students in India who injured themselves (e.g., cutting) were more often from extended families than nuclear ones (Kharsati & Bhola, 2014). One explanation is that these two studies had different populations: College students tend to be from wealthier families, unlike the children in Mumbai.

Overall, single parents are much less common in many nations than in the United States, but in both these studies in India as in research throughout the world, children in single-parent families are more likely to have emotional or academic problems than children living with two parents.

Response for Single Parents (from page 425): Do not get married mainly to provide a second parent for your child. If you were to do so, things would probably get worse rather than better. Do make an effort to have friends of both sexes with whom your child can interact.

Family Trouble

All the generalities just explained are averages, with many exceptions. However, two factors interfere with family function in every structure, ethnic group, and nation: low income and high conflict. Many families experience both, because financial stress increases conflict and vice versa.

Wealth and Poverty

Family income correlates with both function and structure. Marriage rates fall in times of recession, and divorce correlates with unemployment. The effects of poverty are cumulative; low socioeconomic status (SES) is especially damaging for children if it begins in infancy and continues through middle childhood (G. Duncan et al., 2010). Low SES correlates with many other problems, and "risk factors pile up in the lives of some children, particularly among the most disadvantaged" (Masten, 2014, p. 95).

Several scholars have developed the *family-stress model*, which holds that any risk factor (such as low income, divorce, single parenthood, or unemployment) damages a family if, and only if, it increases stress on the parents, who then become less patient and responsive to their children. This is true among families of many structures, ethnic groups, and cultures (Emmen et al., 2013).

If economic hardship is ongoing, if uncertainty about the future is high, if parents have little education—all these factors reduce the parents' ability to be the mentors and advocates that children need. Instead, adults become tense and hostile toward their partners and children. Thus, as many studies have found, although low SES makes many stresses more likely, and adults certainly should not be blamed if worries about food and housing make them less patient with their children, nonetheless the parents' *reaction* to their situation is more important than income alone (Valdez et al., 2013; Evans & Kim, 2013; D. Lee et al., 2013).

Adults whose upbringing included less education and impaired emotional control often find it difficult to find employment and care for their children, and then low income adds to their difficulties (Schofield et al., 2011). Health problems in infancy may lead to "biologically embedded" stresses that impair adult well-being, which affects the next generation (Masten, 2013).

If all this is so, more income means better family functioning, especially if the income is stable, not a windfall. For example, children in single-mother households do much better if their father reliably pays child support, even if he is not actively involved in the child's daily life (Huang, 2009). Nations that subsidize single parents (e.g., Austria and Iceland) also have smaller achievement gaps between low- and middle-SES children on the TIMSS. This finding is suggestive,



You Idiot! Ideally, parents never argue in front the children, as these two do here. However, *how* they argue is crucial. Every couple disagrees about specifics of family life; dysfunctional families call each other names. Hopefully, he said "I know how to fit this bike into the car" and she answered "I was just trying to help," rather than either one escalating the fight by saying "It was your stupid idea to take this trip!"

but controversial and value-laden. Some developmentalists report that raising income does *not*, by itself, improve parenting (L. Berger et al., 2009).

In fact, reaction to wealth may also cause difficulty. Children in high-income families develop more than their share of developmental problems. Wealthy parents may be stressed by needing to maintain their achievements. In addition, they may pressure their children to excel, or they may become too lax in reacting to early use of alcohol and other drugs. That may create externalizing and internalizing problems in middle childhood that lead to drug use, delinquency, and poor academic performance (Luthar & Barkin, 2012).

Conflict

There is no disagreement about conflict: Every researcher agrees that family conflict harms children, especially when adults fight about child rearing. Such fights are more common in stepfamilies, divorced families, and extended families, but nuclear families are not immune. In every family, children suffer not only if they are abused, physically or emotionally, but also if they merely witness their parents' abuse. Fights between siblings can be harmful, too (Turner et al., 2012).

Researchers have hypothesized that children are emotionally troubled in families with feuding parents because of their genes, not because of witnessing the parents fighting. The idea is that the parents' genes lead to marital problems and that children who inherit those same genes will have similar temperaments. If that is the case, then it doesn't matter if children are exposed to their parents' conflicts.

This idea was tested in a longitudinal study of 867 twin pairs (388 monozygotic pairs and 479 dizygotic pairs), all married with an adolescent child. Each adolescent was compared to his or her cousin, the child of one parent's twin (Schermerhorn et al., 2011). Thus, this study had data on family conflict from 5,202 individuals—one-third of them adult twins, one-third of them spouses of twins, and one-third of them adolescents who were genetically linked to another adolescent.

The researchers found that, although genes had some influence, witnessing conflict had a more powerful effect, causing externalizing problems in boys and internalizing problems in girls. In this study, quiet disagreements did little harm, but open conflict (such as yelling when children could hear) or divorce did (Schermerhorn et al., 2011). That leads to an obvious conclusion: Parents should not fight in front of their children.

SUMMING UP Families serve five crucial functions for school-age children: to supply basic necessities, to encourage learning, to develop self-respect, to nurture friendships, and to provide harmony and stability.

Nuclear families (headed by two biological parents) are the most common family structure and tend to provide more income, stability, and parental attention, all of which benefit children. Many other families are headed by a single parent, usually the mother—half because she never married and half because she divorced. Many other family types are possible.

Children sometimes do well in every structure, but each structure has vulnerabilities. Although structures affect function, no structure inevitably harms children, and no structure (including nuclear) guarantees optimal function. Poverty and wealth can both cause stress, which interferes with family function: When parents worry about income, they are less likely to be patient and responsive with their children. Conflict between the parents affects the children, no matter what the family structure.

WHAT HAVE YOU LEARNED?

1. How is it that siblings raised together do not share the exact same environment?
2. What is the difference between family structure and family function?
3. Why is a harmonious, stable home particularly important during middle childhood?
4. Describe the characteristics of four different family structures.
5. What are the advantages for children in a nuclear family structure?
6. List three reasons why the single-parent structure might function less well for children.
7. In what ways are family structure and family function affected by culture?
8. Using the family-stress model, explain how low family income might affect family function.

The Peer Group

Peers become increasingly important in middle childhood. With their new awareness of reality (concrete operations), children are painfully aware of their classmates' opinions, judgments, and accomplishments.

The Culture of Children

Peer relationships, unlike adult–child relationships, involve partners who negotiate, compromise, share, and defend themselves as equals. Consequently, children learn social lessons from one another that grown-ups cannot teach (Rubin et al., 2013). Adults sometimes command obedience, sometimes are subservient, but they are always much older and bigger, with their own values and experiences.

Child culture includes the customs, rules, and rituals that are passed down to younger children from slightly older ones. Jump-rope rhymes, insults, and superstitions are often part of peer society. Even nursery games echo child culture. For instance, "Ring around the rosy/Pocketful of posy/Ashes, ashes/We all fall down," may have originated as children coped with the Black Death, which killed half the population of Europe in the fourteenth century (Kastenbaum, 2012). (*Rosy* may be short for *rosary,* the circle of prayer beads of Roman Catholics; posy may be the dried flowers of the herbs thought to deflect sickness—but no one knows for sure.)

Throughout the world, child culture encourages independence from adults. Many children reject clothes that parents buy as too loose, too tight, too long, too short, or wrong in color, style, brand, decoration, or some other aspect that adults might not notice.

Appearance is important in child culture, but more important is a measure of independence from adults. Classmates pity those (especially boys) whose parents kiss them ("mama's boy"), tease children who please the teachers ("teacher's pet," "suck-up"), and despise those who betray children to adults ("tattletale," "grasser," "snitch," "rat"). Keeping secrets from parents and teachers is a moral mandate (Gillis, 2008).

The culture of children is not always benign. For example, because communication with peers is vital, children learn the necessary languages. Parents proudly note how well their children speak a second language, but may be distressed when their children spout their peers' curses, accents, and slang. Because they value independence, children find friends who defy authority, sometimes harmlessly (passing a note in class), sometimes not (shoplifting, smoking). If a bully teases or isolates a child, it is hard for the other children to defend the one who is shunned.

child culture The particular habits, styles, and values that reflect the set of rules and rituals that characterize children as distinct from adult society.



L HANAZAKI PHOTOGRAPHY/FLICKR RF/GETTY IMAGES

No Toys Boys in middle childhood are happiest playing outside with equipment designed for work. This wheelbarrow is perfect, especially because at any moment the pusher might tip it.

Friendships

Teachers may try to separate friends, but developmentalists find that friends teach each other academic and social skills (Bagwell & Schmidt, 2011). It is a mistake to assume that friends are the source of trouble, although obviously each relationship is distinct. Aggressive children seek other aggressive children, and then they both exclude outsiders, but at least they learn loyalty via the friendship (Rubin et al., 2013).

Remember Yolanda and Paul from Chapter 12? Their friends guided them:

> *Yolanda:*
>
> There's one friend . . . she's always been with me, in bad or good . . . She's always telling me, "Keep on going and your dreams are gonna come true."
>
> *Paul:*
>
> I think right now about going Christian, right? Just going Christian, trying to do good, you know? Stay away from drugs, everything. And every time it seems like I think about that, I think about the homeboys. And it's a trip because a lot of the homeboys are my family, too, you know?
>
> *[quoted in Nieto, 2000, pp. 220, 249]*

Yolanda later went to college; Paul went to jail.

Children want to be liked; consequently they learn faster and feel happier when they have friends. If they had to choose between being friendless but popular (looked up to by many peers) or having close friends but being unpopular (ignored by peers), most would choose to have friends (Bagwell & Schmidt, 2011). A wise choice.

Friendships become more intense and intimate over the years of middle childhood, as social cognition and effortful control advance. Six-year-olds may like anyone of the same sex and age who is willing to play with them. By age 10, children demand more of their friends. They share secrets and expect loyalty. Compared to younger children, older children change friends less often, become more upset when a friendship breaks up, and find it harder to make new friends.

Older children tend to choose friends whose interests, values, and backgrounds are similar to their own. By the end of middle childhood, close friendships are almost always between children of the same sex, age, ethnicity, and socioeconomic status (Rubin et al., 2013). This occurs not because children naturally become more prejudiced over the course of middle childhood (they do not) but because they seek friends who understand and agree with them.

Gender differences persist in activities (girls converse more whereas boys play more active games), but both boys and girls want best friends and usually find them. Having no close friends at age 11 predicts depression at age 13 (Brendgen et al., 2010).

Popular and Unpopular Children

In North American culture, shy children are not popular, but a 1990 survey in Shanghai found that shy children were liked and respected (X. Chen et al., 1992). Twelve years later, assertiveness became more valued in China: A survey from the same schools found shy children less popular than their shy predecessors had been (X. Chen et al., 2005). A few years later, a third study in rural China found shyness still valued; it predicted adult adjustment (X. Chen et al., 2009).

Finally, a fourth study from a Chinese city found that shyness in middle childhood predicted unhappiness later on—unless the shy child was also academically superior, in which case shyness was not a disability (X. Chen et al., 2013). Obviously, cohort and context matter.

In the United States, two types of popular children and three types of unpopular children are apparent in middle childhood (Cillessen & Marks, 2011). First, at every age, children who are friendly and cooperative are well liked. By the end of middle childhood, status becomes as important as likeability. Consequently, a second type of popularity begins: Children who are dominant and somewhat aggressive are also popular (Shi & Xie, 2012).

As for the three types of unpopular children, some are *neglected*, not rejected, ignored but not shunned. The other two types are actively rejected. Some are **aggressive-rejected,** disliked because they are antagonistic and confrontational. Others are **withdrawn-rejected,** disliked because they are timid and anxious.

Both aggressive-rejected and withdrawn-rejected children often misinterpret social situations, lack emotional regulation, and experience mistreatment at home. Each of these problems causes rejection, and then rejection makes home and school worse for the child (Stenseng et al., 2014). If they are not guided toward friendship with at least one other child, they may become bullies and victims.

aggressive-rejected Rejected by peers because of antagonistic, confrontational behavior.

withdrawn-rejected Rejected by peers because of timid, withdrawn, and anxious behavior.

bullying Repeated, systematic efforts to inflict harm through physical, verbal, or social attack on a weaker person.

Bullies and Victims

Bullying is defined as repeated, systematic attacks intended to harm those who are unable or unlikely to defend themselves. It occurs in every nation, in every community, and in every kind of school (religious or secular, public or private, progressive or traditional, large or small) and perhaps in every child. As one girl said, "There's a little bit of bully in everyone" (Guerra et al., 2011, p. 303).

As one boy explained:

> You can get bullied because you are weak or annoying or because you are different. Kids with big ears get bullied. Dorks get bullied. You can also get bullied because you think too much of yourself and try to show off. Teacher's pet gets bullied. If you say the right answer too many times in class you can get bullied. There are lots of popular groups who bully each other and other groups, but you can get bullied within your group too. If you do not want to get bullied, you have to stay under the radar, but then you might feel sad because no one pays attention to you.
>
> *[quoted in Guerra et al., 2011, p. 306]*

Bullying may be of four types:

- *Physical* (hitting, pinching, shoving, or kicking)
- *Verbal* (teasing, taunting, or name-calling)
- *Relational* (destroying peer acceptance)
- *Cyberbullying* (using electronic means to harm another)

The first three types are common in primary school and begin even earlier, in preschool. Cyberbullying is more common later on. (**Developmental Link:** Cyberbullying is discussed in Chapter 15.)

A key word in the definition of bullying is *repeated*. Almost every child experiences an isolated attack or is called a derogatory name at some point. Victims of bullying, however, endure shameful experiences again and again—being forced to hand over lunch money, laugh at insults, drink milk mixed with detergent, and so on—with no one defending them. Victims tend to be "cautious, sensitive, quiet . . . lonely and abandoned at school. As a rule, they do not have a single good friend in their class" (Olweus et al., 1999, p. 15).

Victims are chosen not because of their perceived appearance or behavior but because of their emotional vulnerability and social isolation. Children new to a school, or whose background and home culture are unlike that of their peers, are especially vulnerable.



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HENRY KING/GETTY IMAGES

Who Suffers More? Physical bullying is typically the target of anti-bullying laws and policies, because it is easier to spot than relational bullying. Moreover, it is easier to stop—a boy can learn to never put his hands on another boy. But being rejected from the group, especially with gossip and lies, is more devastating to the victim and harder to control. How would the girls respond if the teacher said "She has to be your friend"?

bully-victims People who attack others and who are attacked as well. (Also called *provocative victims* because they do things that elicit bullying.)

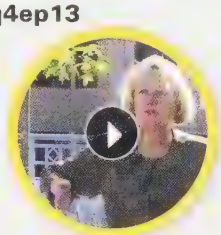
Remember the three types of unpopular children? Neglected children are not victimized; they are ignored, "under the radar." If their family relationships are good, they suffer less even if they are bullied (which they usually are not) (Bowes et al., 2010).

Withdrawn-rejected children are often victims; they are isolated, feel depressed, and are friendless. Aggressive-rejected children are called **bully-victims** (or *provocative victims*), with neither friends nor sympathizers. They suffer the most because they strike back ineffectively, which increases the bullying (Dukes et al., 2009).

Unlike bully-victims, most bullies are *not* rejected. Although some have low self-esteem, others are proud; they are pleased with themselves, they have friends who admire them and classmates who fear them (Guerra et al., 2011). As already mentioned, some are quite popular, with bullying a form of social dominance and authority (Pellegrini et al., 2012). Over the years of middle childhood, bullies become skilled at avoiding adult awareness, picking victims who are rejected by most classmates and who will not resist or tell.

Boys bully more than girls, usually physically attacking smaller, weaker boys. Girl bullies usually use words to attack shyer, more soft-spoken girls. Young boys can sometimes bully girls, but by puberty (about age 11), boys who bully girls are not admired (Veenstra et al., 2010), although sexual teasing is. Especially in the final years of middle childhood, boys who are thought to be gay become targets, with suicide attempts one consequence (Hong & Garbarino, 2012).

Bullying: Interview with Nicki Crick explains the characteristics of bullies.
http://qrs.ly/nq4ep13



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Causes and Consequences of Bullying

Bullying may originate with a genetic predisposition or a brain abnormality, but when a toddler is aggressive, parents, teachers, and peers usually teach emotional regulation and effortful control. If home life is stressful, if discipline is ineffectual, if siblings are hostile, or if attachment is insecure, those lessons may not be learned or even taught. Instead, vulnerable young children develop externalizing and internalizing problems, becoming bullies or victims in middle childhood (Turner et al., 2012).

Peers are crucial. Some peer groups approve of relational bullying, and then children entertain their classmates by mocking and insulting each other (Werner & Hill, 2010). On the other hand, when students themselves disapprove of bullying, its incidence is reduced (Guerra & Williams, 2010). Age is also an important factor. For most of childhood, bullies are disliked, but a switch occurs at about age 11, when bullying becomes a way to gain social status (Caravita & Cillessen, 2012).

The consequences of bullying can echo for years, worsening with age. Many victims become depressed; many bullies become increasingly cruel. The worst bullies seem unmoved by their victims' distress: Such bullies tend to become more aggressive with age (Willoughby et al., 2014).

Unless bullies are deterred, they and their victims risk impaired social understanding, lower school achievement, and relationship difficulties. Decades later they have higher rates of mental illness (Copeland et al., 2013; Ttofi et al., 2014). Compared to other adults the same age, former bullies are more likely to die young, be jailed, or have destructive marriages. Bystanders suffer, too: They learn less when bullying is common, and they are often distressed but afraid to help the victim (Juvonen & Graham, 2014; Monks & Coyne, 2011).

Can Bullying Be Stopped?

Most victimized children find ways to halt ongoing bullying—by ignoring, retaliating, defusing, or avoiding. Friends defend each other and restore self-esteem (Bag-



well & Schmidt, 2011). Friendships help individual victims, but what can be done to halt a culture of bullying?

We know what does *not* work: simply increasing students' awareness of bullying, instituting zero tolerance for fighting, or putting bullies together in a therapy group or a classroom (Baldry & Farrington, 2007; Monks & Coyne, 2011). This last measure tends to make daily life easier for some teachers, but it increases aggression. Another strategy is to talk to the parents of the bully, but this may backfire. Since one cause of bullying is poor parent–child interaction, talking to the bully's or victim's parents may "create even more problems for the child, for the parents, and for their relationship" (Rubin et al., 2013, p. 267).

Especially for Parents of an Accused Bully
Another parent has told you that your child is a bully. Your child denies it and explains that the other child doesn't mind being teased.
(see response, page 435)

The school community as a whole—teachers and bystanders, parents and aides, bullies and victims and bystanders—needs to change. In fact, the entire school can either increase the rate of bullying or decrease it (Juvonen & Graham, 2014). For example, a Colorado study found that, when the overall school climate encouraged learning and cooperation, children with high self-esteem were unlikely to be bullies; when the school climate was hostile, those with high self-esteem were often bullies (Gendron et al., 2011).

Again, peers are crucial: They must do more than simply notice bullying, becoming aware without doing anything to counter it. In fact, some bystanders feel morally disengaged from the victims, which increases bullying. Others are sympathetic but feel powerless (Thornberg & Jungert, 2013). However, if they empathize with victims, feel effective (high in effortful control), and refuse to admire bullies, classroom aggression is reduced (Salmivalli, 2010).

Efforts to change the entire school are credited with recent successful efforts to decrease bullying in 29 schools in England (Cross et al., 2011), throughout Norway, in Finland (Kärnä et al., 2011), and often in the United States (Allen, 2010; Limber, 2011).

A review of ways to halt bullying (Berger, 2007) finds that:

- Everyone in the school must change, not just the identified bullies.
- Intervention is more effective in the earlier grades.
- Evaluation is critical: Programs that seem good might be harmful.

This final point merits emphasis. Longitudinal research finds that some programs make a difference and some do not. Variations depend on the age of the children and the indicators (peer report of bullying or victimization, teacher report of incidents reported, and so on). Objective follow-up efforts suggest that bullying can be reduced but not eliminated.

It is foolhardy to blame only the bully and, of course, wrong to blame the victim: The entire school community—including the culture of the school—needs to change. That leads to the final topic of this chapter, moral development.

SUMMING UP School-age children develop their own culture, with customs that encourage them to be loyal to one another. All 6- to 11-year-olds want and need social acceptance and close, mutual friendships to protect against loneliness and depression. Children of all ages value peers who are kind and outgoing. By the end of middle childhood, peers who are self-assured and aggressive may be admired as well. Friendship is more valued than popularity; being rejected is painful.

Most children experience occasional peer rejection. However, some children are victims—repeatedly rejected and friendless—and experience physical, verbal, or relational bullying. Bullies may have friends and social power in middle childhood and early adolescence, but as time goes on, they may become increasingly cruel and less admired. Some efforts to reduce bullying succeed and some do not. A whole-school approach seems best, with the bystanders crucial to establishing an anti-bullying culture.

WHAT HAVE YOU LEARNED?

1. How does what children wear reflect the culture of children?
2. In what ways do friendships change from the beginning to the end of middle childhood?
3. How is a child's popularity affected by culture and cohort?
4. What are the similarities and differences between boy bullies and girl bullies?
5. How might bullying be reduced?

Children's Moral Values

The origins of morality are debatable (see Chapter 10), but there is no doubt that middle childhood is prime time for moral development. These are:

> years of eager, lively searching on the part of children . . . as they try to understand things, to figure them out, but also to weigh the rights and wrongs. . . . This is the time for growth of the moral imagination, fueled constantly by the willingness, the eagerness of children to put themselves in the shoes of others.
>
> *[Coles, 1997, p. 99]*

Wonderfully Conventional Krysta Caltabiano displays her poster, "Ways to Be a Good Citizen," which won the Good Citizenship Contest sponsored by the Connecticut Secretary of State.



Many forces drive children's growing interest in moral issues. Three of them are (1) child culture, (2) personal experience, and (3) empathy. As already explained, the culture of children includes moral values, such as loyalty to friends and keeping secrets. Personal experiences also matter.

For all children, empathy increases in middle childhood as children become more socially perceptive. This increasing perception can backfire, however. One example was just described: Bullies become adept at picking victims (Veenstra et al., 2010). An increase in social understanding makes noticing and defending rejected children possible, but in a social context that allows bullying, bystanders may decide to be self-protective rather than to intervene (Pozzoli & Gini, 2013).

Children who are slow to develop theory of mind—which, as discussed in Chapter 9, is affected by family and culture—are also slow to develop empathy (Caravita et al., 2010). The authors of a study of 7-year-olds "conclude that moral *competence* may be a universal human characteristic, but that it takes a situation with specific demand characteristics to translate this competence into actual prosocial performance" (van Ijzendoorn et al., 2010, p. 1). In other words, school-age children can think and act morally, but they do not always do so.

Moral Reasoning

Piaget wrote extensively about the moral development of children, as they developed and enforced their own rules for playing games together (Piaget, 1932/1997). His emphasis on how children think about moral issues led to a famous description of cognitive stages of morality (Kohlberg, 1963).

Kohlberg's Levels of Moral Thought

Lawrence Kohlberg described three levels of moral reasoning and two stages at each level (see Table 13.3), with parallels to Piaget's stages of cognition.

preconventional moral reasoning Kohlberg's first level of moral reasoning, emphasizing rewards and punishments.

conventional moral reasoning Kohlberg's second level of moral reasoning, emphasizing social rules.

postconventional moral reasoning Kohlberg's third level of moral reasoning, emphasizing moral principles

- **Preconventional moral reasoning** is similar to preoperational thought in that it is egocentric, with children most interested in their personal pleasure or avoiding punishment.
- **Conventional moral reasoning** parallels concrete operational thought in that it relates to current, observable practices: Children watch what their parents, teachers, and friends do, and try to follow suit.
- **Postconventional moral reasoning** is similar to formal operational thought because it uses abstractions, going beyond what is concretely observed, willing to question "what is" in order to decide "what should be."



According to Kohlberg, intellectual maturation advances moral thinking. During middle childhood, children's answers shift from being primarily preconventional to being more conventional: Concrete thought and peer experiences help children move past the first two stages (level I) to the next two (level II). Postconventional reasoning is not usually present until adolescence or adulthood, if then.

Kohlberg posed moral dilemmas to school-age boys (and eventually girls, teenagers, and adults). The most famous example of these dilemmas involves a poor man named Heinz, whose wife was dying. He could not pay for the only drug that could cure his wife, a drug that a local druggist sold for 10 times what it cost to make.

> Heinz went to everyone he knew to borrow the money, but he could only get together about half of what it cost. He told the druggist that his wife was dying and asked him to sell it cheaper or let him pay later. But the druggist said "no." The husband got desperate and broke into the man's store to steal the drug for his wife. Should the husband have done that? Why?
>
> *[Kohlberg, 1963, p. 19]*

The crucial element in Kohlberg's assessment of moral stages is not what a person answers but the reasons given. For instance, suppose a child says that Heinz should steal the drug. That itself does not indicate the child's level of moral reasoning. The reason could be that Heinz needs his wife to care for him (preconventional), or that people will blame him if he lets his wife die (conventional), or that a human life is more important than obeying a law (postconventional).

Or suppose another child says Heinz should not steal. The reason could be that he will go to jail (preconventional), or that the child has been taught that stealing is wrong (conventional), or that for a community to function, no one should take another person's livelihood (postconventional).

// **Response for Parents of an Accused Bully** (from page 433): The future is ominous if the charges are true. Your child's denial is a sign that there is a problem. (An innocent child would be worried about the misperception instead of categorically denying that any problem exists.) You might ask the teacher what the school is doing about bullying. Family counseling might help. Because bullies often have friends who egg them on, you may need to monitor your child's friendships and perhaps befriend the victim. Talk matters over with your child. Ignoring the situation might lead to heartache later on.

Criticisms of Kohlberg

Kohlberg has been criticized for not appreciating cultural or gender differences. For example, loyalty to family overrides any other value in some cultures, so some people might avoid postconventional actions that hurt their family. Also, Kohlberg's original participants were all boys, which may have led him to discount nurturance and relationships, thought to be more valued by females than males (Gilligan, 1982). Overall, Kohlberg seemed to value abstract principles more than individual needs and to evaluate people on how rational they are.

However, emotional thinking may be more influential than logic in moral development (Haidt, 2013). Thus, according to critics of Kohlberg, emotional regulation, empathy, and social understanding, all of which develop throughout childhood, may be more crucial for morality than intellectual development is.

Furthermore, Kohlberg did not seem to recognize that although children's morality differs from that of adults, they may be quite moral. School-age children tend to

Kohlberg's Three Levels and Six Stages of Moral Reasoning

Level I: Preconventional Moral Reasoning

The goal is to get rewards and avoid punishments; this is a self-centered level.

- *Stage one: Might makes right* (a punishment-and-obedience orientation). The most important value is to maintain the appearance of obedience to authority, avoiding punishment while still advancing self-interest. Don't get caught!
- *Stage two: Look out for number one* (an instrumental and relativist orientation). Each person tries to take care of his or her own needs. Be nice to other people so that they will be nice to you.

Level II: Conventional Moral Reasoning

Emphasis on social rules; this is a family, community, and cultural level.

- *Stage three: Good girl and nice boy.* Proper behavior pleases other people. Social approval is more important than any specific reward.
- *Stage four: Law and order.* Proper behavior means being a dutiful citizen and obeying the laws set down by society, even when no police are nearby.

Level III: Postconventional Moral Reasoning

Emphasis is placed on moral principles; this level is centered on ideals.

- *Stage five: Social contract.* Social rules are obeyed when they benefit everyone and are established by mutual agreement. If the rules become destructive or if one party doesn't live up to the agreement, the contract is no longer binding. Under those circumstances, disobeying the law may be moral.
- *Stage six: Universal ethical principles.* Universal principles, not individual situations (level I) or community practices (level II), determine right and wrong. Ethical values (such as "life is sacred") are established by thought and prayer. They may contradict egocentric (level I) or social and community (level II) values.

question or ignore adult rules that seem unfair (Turiel, 2006, 2008), and that may indicate postconventional thinking.

In one respect, however, Kohlberg was undeniably correct. He was right in noting that children use their intellectual abilities to justify their moral actions. In one experiment, children aged 8 to 18 were grouped with two others about the same age and were allotted some money. They were then asked to decide how much to share with another trio of children.

No age trends were found in sharing: Some groups chose to share equally; other groups were more selfish. However, there were age differences in the reasons. Older children suggested more complex rationalizations for their choices, both selfish and altruistic (Gummerum et al., 2008).

What Children Value

Many lines of research have shown that children develop their own morality, guided by peers, parents, and culture (Killen & Smetana, 2014). Some prosocial values are evident in early childhood including caring for close family members, cooperating with other children, and not hurting anyone intentionally.

Even very young children think stealing is wrong, and even infants seem to appreciate social support and punish mean behavior in experiments with a good and a mean puppet (Hamlin, 2014). If a puppet is seen hitting another puppet for no good reason, and then a child is asked to allocate candy to the two puppets, the child might give candy to the victim, not the bully.

As children become more aware of themselves and others in middle childhood, they realize that one person's values may conflict with another's. Concrete operational cognition, which gives children the ability to understand and use logic, propels them to think about morality. In the opening anecdote of this chapter, when the boy argued that it was "so unfair" that he could not kill zombies in the video game, a sense of morality was evident.

Adults Versus Peers

When child culture conflicts with adult morality, children often align themselves with peers. A child might lie to protect a friend, for instance. Friendship itself has a hostile side: Many close friends reject other children who want to join a game, or conversation, with friends (Rubin et al., 2013). They may also protect a bully if he or she is a friend.

The conflict between the morality of children and that of adults is evident in the value that children place on education. Adults usually prize school and respect teachers, but children may encourage one another to play hooky, cheat on tests, harass a substitute teacher, and so on.

Three common moral imperatives among 6- to 11-year-olds are the following:

- Protect your friends.
- Don't tell adults what is happening.
- Conform to peer standards of dress, talk, behavior.

These three can explain both apparent boredom and overt defiance, as well as standards of dress that mystify adults (such as jeans so loose that they fall off or so tight that they impede digestion—both styles worn by my children, who grew up in different cohorts). This may seem like mere social conformity, but children may elevate it to a standard of right and wrong, as adults might do for whether or not a woman wears a head covering, a revealing dress, or even high



Not Victims An outsider might worry that these two boys would be bullied, one because he is African American and the other because he appears to be disabled. But both are well liked for the characteristics shown here: friendliness and willingness to help and be helped.

GETTY IMAGES



heels. Given what is known about middle childhood, it is no surprise that children do not echo adult morality.

Fortunately, peers during adulthood as well as childhood help one another develop morals. Research finds that children are better at stopping bullying than adults are, because bystanders are pivotal. Since bullies tend to be low on empathy, they need peers to teach them that their actions are not admired (many bullies believe people admire their aggression). During middle childhood, morality can be scaffolded just as cognitive skills are, with mentors—peers or adults—using moral dilemmas to advance moral understanding, while they also advance the underlying moral skills of empathy and emotional regulation (Hinnant et al., 2013).

Developing Moral Values

Throughout middle childhood, moral judgment becomes more comprehensive, considering psychological as well as physical harm, intentions as well as consequences. In one study 5- to 11-year-olds saw pictures depicting situations when a child hurt another to prevent further harm (stopping a friend from a dangerous climb to retrieve a ball) or when one child was simply mean (such as pushing a friend off the swings so the child can swing). The younger children were more likely to judge based on results, but the older children considered intention.

When harm was psychological, not physical (hurting the child's feelings, not hitting) more than half of the older children considered intentions, but only about 5 percent of the younger children did. Compared to the younger children, the older children more often said justifiable harm was okay but unjustifiable harm should be punished (Jambon & Smetana, 2014).

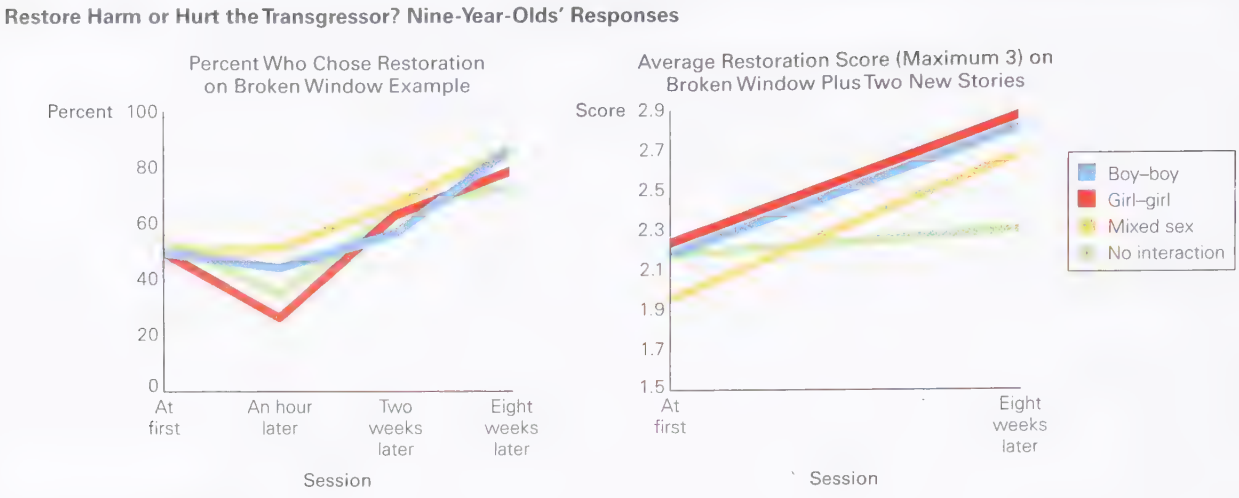
A detailed examination of the effect of peers on morality began with an update on one of Piaget's moral issues: whether punishment should seek *retribution* (hurting the transgressor) or *restitution* (restoring what was lost). Piaget found that children advance from retribution to restitution between ages 8 and 10 (Piaget, 1932/1997).

To learn how this occurs, researchers asked 133 9-year-olds to consider this scenario:

> Late one afternoon there was a boy who was playing with a ball on his own in the garden. His dad saw him playing with it and asked him not to play with it so near the house because it might break a window. The boy didn't really listen to his dad, and carried on playing near the house. Then suddenly, the ball bounced up high and broke the window in the boy's room. His dad heard the noise and came to see what had happened. The father wonders what would be the fairest way to punish the boy. He thinks of two punishments. The first is to say: "Now, you didn't do as I asked. You will have to pay for the window to be mended, and I am going to take the money from your pocket money." The second is to say: "Now, you didn't do as I asked. As a punishment you have to go to your room and stay there for the rest of the evening." Which of these punishments do you think is the fairest?
>
> *[Leman & Björnberg, 2010, p. 962]*

The children were split almost equally in their initial responses. Then 24 pairs were formed of children who had opposite views. Each pair was asked to discuss the issue, trying to reach agreement. (The other children did not discuss it.) Six pairs were boy–boy, six were boy–girl with the boy favoring restitution, six were boy–girl with the girl favoring restitution, and six were girl–girl.

The conversations typically took only five minutes, and the retribution side was more often chosen—which Piaget would consider a moral backslide, since more restitution than retribution advocates switched. However, two weeks and eight weeks later all the children were queried again. Many responses changed toward the more advanced, restitution response (see Figure 13.2). This advance occurred even for the children who merely thought about the dilemma again (no discussion)



Source: Leman & Björnberg, 2010.

FIGURE 13.2

Benefits of Time and Talking The graph on the left shows that most children, immediately after their initial punitive response, became even more likely to seek punishment rather than to repair damage. However, after some time and reflection, they chose the response Piaget considered more mature. The graph on the right indicates that children who had talked about the broken window example moved toward restorative justice even in examples they had not heard before. That was not true for those who had not talked about the first story.

but children who had discussed it with another child were particularly likely to decide that restitution was best.

The main conclusion from this study was that "conversation on a topic may stimulate a process of individual reflection that triggers developmental advances" (Leman & Björnberg, 2010, p. 969). Parents and teachers take note: Raising moral issues, and letting children discuss them, advances morality—not immediately, but soon.

Think again about the opening anecdote for this chapter (killing zombies) or the previous chapter (piercing ears). In both cases, the parent used age as a criterion, and in both cases the child rejected that argument. A better argument might raise a higher standard—in the first example, for instance, that killing is never justified. The child might disagree, but such conversations might help the child think more deeply about moral values, as happened in this experiment. That deeper thought might protect the child during adolescence, when life-changing moral issues arise, which is described in the next three chapters.

SUMMING UP Moral issues are of great interest to children in middle childhood, when children become more aware of the values of their cultures, their parents, and particularly of their peers. Kohlberg's stages of moral thought are based on advancing rationalism, in parallel to Piaget's stages of development. He believed the progression is universal, from the young child's egocentrism to the adults' highest level of morality, which transcends the norms of any particular nation. Kohlberg has been criticized for not having a multicultural understanding, but he seems correct in his conclusion that moral judgment advances from ages 6 to 11. Children develop moral standards that they try to follow. These may differ from adult morals, in part because children's morality includes loyalty to peers. Maturation, reflection, and discussion all foster moral development.

WHAT HAVE YOU LEARNED?

1. Using your own example, illustrate Kohlberg's three levels of moral reasoning.
2. What are the main criticisms of Kohlberg's theory?
3. What three values are common among school-age children?
4. What seems to advance moral thought from the beginning to the end of middle childhood?

SUMMARY

The Nature of the Child

1. All theories of development acknowledge that school-age children become more independent and capable in many ways.
2. Erikson emphasized industry, when children busily strive to master various tasks. If they are unable to do so, they feel inferior. Freud described latency, when psychosexual needs are quiet.
3. Children develop their self-concept during middle childhood, basing it on a more realistic assessment of their competence than they had in earlier years.
4. Self-respect is always helpful, but high self-esteem may reduce effort and is not valued in every culture. Low self-esteem is also harmful.
5. Both daily hassles and major stresses take a toll on children, with accumulated stresses more likely to impair development than any single event on its own. Resilience is aided by the child's interpretation of the situation and the availability of supportive adults, peers, and institutions.

Families and Children

6. Families influence children in many ways, as do genes and peers. Although most siblings share a childhood home and parents, each sibling experiences different (nonshared) circumstances within the family.
7. The five functions of a supportive family are to satisfy children's physical needs, to encourage learning, to support friendships, to protect self-respect, and to provide a safe, stable, and harmonious home.
8. The most common family structure worldwide is the nuclear family, usually with other relatives nearby. Other two-parent families include adoptive, same-sex, grandparent, and stepfamilies, each of which is capable of functioning well for children. However, each also has vulnerabilities.
9. On average, children have fewer emotional problems and learn more in school if they live with two parents rather than one, especially if the two have a good parental alliance, so that both adults are caregivers.
10. Single-parent families have higher rates of change —for example, in where they live and who belongs to the family. On average, such families have less income, which may cause stress. Nonetheless, some single parents are better parents than they would be if the child's other parent were in the household.
11. Income affects family function, for two-parent as well as single-parent households. Poor children are at greater risk for emotional and behavioral problems because the stresses that often accompany poverty hinder effective parenting.
12. No matter what the family SES, instability and conflict are harmful. Children suffer even when the conflict does not involve them directly, but their parents or siblings fight.

The Peer Group

13. Peers teach crucial social skills during middle childhood. Each cohort of children has a culture, passed down from slightly older children. Close friends are wanted and needed.
14. Popular children may be cooperative and easy to get along with or may be competitive and aggressive. Children's judgment of popularity is affected by culture as well as the age of the children.
15. Rejected children may be neglected, aggressive, or withdrawn. Aggressive and withdrawn children have difficulty with social cognition; their interpretation of the normal give-and-take of childhood is impaired.
16. Bullying is common among school-age children and has long-term consequences for both bullies and victims. Bullies themselves may be admired, which makes their behavior more difficult to stop.
17. Overall, a multifaceted, long-term, whole-school approach—with parents, teachers, and bystanders working together—seems the best way to halt bullying.

Children's Moral Values

18. School-age children seek to differentiate right from wrong. Peer values, cultural standards, and family practices are all part of their personal morality.
19. Children advance in moral thinking as they mature. Kohlberg described three levels of moral reasoning, each related to cognitive maturity. His description has been criticized for ignoring cultural and gender differences and for stressing rationality at the expense of emotions.
20. When values conflict, children often choose loyalty to peers over adult standards of behavior. As children grow older, especially when they discuss moral issues, they develop more thoughtful answers to moral questions, considering intentions as well as consequences.

KEY TERMS

industry versus inferiority (p. 410)
latency (p. 410)
social comparison (p. 411)
resilience (p. 413)
family structure (p. 418)
family function (p. 418)
nuclear family (p. 419)
single-parent family (p. 419)
extended family (p. 419)
polygamous family (p. 420)
child culture (p. 429)
aggressive-rejected (p. 431)
withdrawn-rejected (p. 431)
bullying (p. 431)
bully-victim (p. 432)
preconventional moral reasoning (p. 434)
conventional moral reasoning (p. 434)
postconventional moral reasoning (p. 434)

APPLICATIONS

1. Go someplace where school-age children congregate (such as a schoolyard, a park, or a community center) and use naturalistic observation for at least half an hour. Describe what popular, average, withdrawn, and rejected children do. Note at least one potential conflict (bullying, rough-and-tumble play, etc.). Describe the sequence and the outcome.
2. Focusing on verbal bullying, describe at least two times when someone said something hurtful to you and two times when you said something that might have been hurtful to someone else. What are the differences between the two types of situations?
3. How would your childhood have been different if your family structure had been different, such as if you had (or had not) lived with your grandparents, if your parents had (or had not) gotten divorced, if you had (or had not) been adopted?
4. Interview two parents, one in a nuclear family and one in a single-parent family. Ask them about the advantages and disadvantages of that family structure. If they do not know, ask about specifics (homework, rules, punishments, meals). Analyze the results, illustrating them with quotations.

PART 4

The Developing Person So Far:
Middle Childhood





GM VISUALS/GETTY IMAGES

BIOSOCIAL

A Healthy Time During middle childhood, children grow more slowly than they did earlier or than they will during adolescence. Physical play is crucial for health and happiness. Prevalent physical problems, including obesity and asthma, have genetic roots and are influenced by environmental factors; both have psychosocial consequences.

Brain Development Brain maturation continues, leading to faster reactions and better self-control. The specific skills a child masters depend largely on culture, gender, and inherited ability. Children have multiple intellectual abilities, most of which are not reflected in standard IQ tests.

Children with Special Needs Many children have special learning needs, ranging from severe (e.g., autism spectrum disorder) to wonderful (e.g., gifted). Early recognition, targeted education, and psychological support are needed.



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COGNITIVE

Building on Theory Piaget noted that beginning at about age 7, children attain the logic of concrete operational thought, including the concepts of classification and seriation. Vygotsky emphasized that children become more open to learning from mentors. Information-processing abilities increase, resulting in greater memory, a broader knowledge base, control processes, and metacognition.

Language Children's increasing ability to understand the structures and possibilities of language enables them to extend their cognitive powers. Children have the cognitive capacity to become bilingual and bicultural, although much depends on the teacher.

Teaching and Learning International comparisons reveal marked variations in the overt and hidden curriculums, as well as in learning, between one nation and another. In the United States, most children attend regular public schools in their neighborhood, but some attend charter schools, private schools, or are home-schooled.



WMAY/GETTY IMAGES

PSYCHOSOCIAL

The Nature of the Child Theorists agree that many school-age children develop competencies, emotional control, and attitudes to defend against stress. Some children are resilient, coping with problems and finding support in friends, family, school, religion, and community.

Families and Children Parents influence children, especially as they exacerbate or buffer problems in school and the community. Families need to meet basic needs, encourage learning, foster self-respect, nurture friendship, and—most important—provide harmony and stability. Nuclear families often provide this, and one-parent, foster, same-sex, or grandparent families can also function well for children. Sufficient household income, minimal conflict, and family stability benefit children of all ages and in every family structure.

The Peer Group Children depend less on their parents and more on friends for help, loyalty, and sharing of mutual interests. Rejection and bullying become serious problems.

Children's Moral Values Moral development, influenced by peers, advances during these years. Children develop moral standards that they try to follow, although these may differ from the moral standards of adults. Loyality to peers is a prime value for school-age children.

Appendix
More About Research Methods

This appendix explains how to learn about any topic. It is crucial that you distinguish valid conclusions from wishful thinking. Such learning begins with your personal experience.

Make It Personal

Think about your life, observe your behavior, and watch the people around you. Pay careful attention to details of expression, emotion, and behavior. The more you see, the more fascinated, curious, and reflective you will become. Ask questions and listen carefully and respectfully to what other people say regarding development.

Whenever you ask specific questions as part of an assignment, **remember that observing ethical standards (see Chapter 1) comes first.** *Before* you interview anyone, inform the person of your purpose and assure him or her of confidentiality. Promise not to identify the person in your report (use a pseudonym) and do not repeat any personal details that emerge in the interview to anyone (friends or strangers). Your instructor will provide further ethical guidance. If you might publish what you've learned, get in touch with your college's Institutional Review Board (IRB).

Read the Research

No matter how deeply you think about your own experiences, and no matter how intently you listen to others whose background is unlike yours, you also need to read scholarly published work in order to fully understand any topic that interests you. Be skeptical about magazine or newspaper reports; some are bound to be simplified, exaggerated, or biased.

Professional Journals and Books

Part of the process of science is that conclusions are not considered solid until they are corroborated in many studies, which means that you should consult several sources on any topic. **Four journals in human development** are:

- *Developmental Psychology* (published by the American Psychological Association)
- *Child Development* (Society for Research in Child Development)
- *Developmental Review* (Elsevier)
- *Human Development* (Karger)

These journals differ in the types of articles and studies they publish, but all are well respected and peer-reviewed, which means that other scholars review each

article submitted and recommend that it be accepted, rejected, or revised. Every article includes references to other recent work.

Also look at journals that specialize in longer reviews from the perspective of a researcher.

- *Child Development Perspectives* (from Society for Research in Child Development)
- *Perspectives on Psychological Science* (This is published by the Association for Psychological Science. APS publishes several excellent journals, none specifically on development but every issue has at least one article that is directly relevant.)

Beyond these six are literally thousands of other professional journals, each with a particular perspective or topic, including many in sociology, family studies, economics, and so on. To judge them, look for journals that are peer-reviewed. Also consider the following details: the background of the author (research funded by corporations tends to favor their products); the nature of the publisher (professional organizations, as in the first two journals above, protect their reputations); how long the journal has been published (the volume number tells you that). Some interesting work does not meet these criteria, but these are guides to quality.

Many **books** cover some aspect of development. Single-author books are likely to present only one viewpoint. That view may be insightful, but it is limited. You might consult a *handbook*, which is a book that includes many authors and many topics. One good handbook in development, now in its seventh edition (a sign that past scholars have found it useful) is:

- *Handbook of Child Psychology and Developmental Science. Edited by Richard M. Lerner (7th ed.), 2015, Wiley.*

Again, dozens of good handbooks are available, many of which focus on a particular age, perspective, or topic.

The Internet

The **Internet** is a mixed blessing, useful to every novice and experienced researcher but dangerous as well. Every library worldwide and most homes in North America, Western Europe, and East Asia have computers that provide access to journals and other information. If you're doing research in a library, ask for help from the librarians; many of them can guide you in the most effective ways to conduct online searches. In addition, other students, friends, and even strangers can be helpful.

Virtually everything is on the Internet, not only massive national and international statistics but also accounts of very personal experiences. Photos, charts, quizzes, ongoing experiments, newspapers from around the world, videos, and much more are available at a click. Every journal has a Web site, with tables of contents, abstracts, and sometimes full texts. (An abstract gives the key findings; for the full text, you may need to consult the library's copy of the print version.)

Unfortunately, you can spend many frustrating hours sifting through information that is useless, trash, or tangential. *Directories* (which list general topics or areas and then move you step by step in the direction you choose) and *search engines* (which give you all the sites that use a particular word or words) can help you select appropriate information. Each directory or search engine provides somewhat different lists; none provides only the most comprehensive and accurate sites. Sometimes organizations figure out ways to make their links appear first,

even though they are biased. With experience and help, you will find the best sites for you, but you will also encounter some junk no matter how experienced you are.

Anybody can put anything online, regardless of its truth or fairness, so you need a very critical eye. Make sure you have several divergent sources for every "fact" you find; consider who provided the information and why. Every controversial issue has sites that forcefully advocate opposite viewpoints, sometimes with biased statistics and narrow perspectives.

Here are five Internet sites that are quite reliable:

- *embryo.soad.umich.edu* The Multidimensional Human Embryo. Presents MRI images of a human embryo at various stages of development, accompanied by brief explanations.
- *childdevelopmentinfo.com* Child Development Institute. A useful site, with links and articles on child development and information on common childhood psychological disorders.
- *eric.ed.gov* Education Resources Information Center (ERIC). Provides links to many education-related sites and includes brief descriptions of each.
- *www.nia.nih.gov* National Institute on Aging. Includes information about current research on aging (in case you want to expand your search beyond child development).
- *www.cdc.gov/nchs/hus.htm* The National Center for Health Statistics issues an annual report on health trends, called *Health, United States.*

Every source—you, your interviewees, journals, books, and the Internet—is helpful. Do not depend on any particular one. Avoid plagiarism and prejudice by citing every source and noting objectivity, validity, and credibility. Your own analysis, opinions, words, and conclusions are crucial, backed up by science, as explained in Chapter 1.

Additional Terms and Concepts

As emphasized throughout this text, the study of development is a science. Social scientists spend years in graduate school, studying methods and statistics. Chapter 1 touches on some of these matters (observation and experiments; correlation and statistical significance; independent and dependent variables; experimental and control groups; cross-sectional, longitudinal, and cross-sequential research), but there is much more. A few additional aspects of research are presented here to help you evaluate research wherever you find it.

Who Participates?

The entire group of people about whom a scientist wants to learn is called a **population.** Generally, a research population is quite large—not usually the world's entire population of more than 7 billion, but perhaps all the 4 million babies born in the United States last year, or all the 31 million Japanese currently over age 65.

The particular individuals who are studied in a specific research project are called the **participants.** They are used as a **sample** of the larger group. Ideally, the participants are a **representative sample,** that is, a sample that reflects the entire population. Every peer-reviewed, published study reports details on the sample.

Selection of the sample is crucial. People who volunteer, or people who have telephones, or people who have some particular condition are not a *random sample;*

population The entire group of individuals who are of particular concern in a scientific study, such as all the children of the world or all newborns who weigh less than 3 pounds.

participants The people who are studied in a research project. Participants is the term now used in psychology; other disciplines still call these people "subjects."

sample A group of individuals drawn from a specified population. A sample might be the low-birthweight babies born in four particular hospitals that are representative of all hospitals.

representative sample A group of research participants who reflect the relevant characteristics of the larger population whose attributes are under study.

in a random sample, everyone in a particular population is equally likely to be selected. To avoid *selection bias,* some studies are *prospective,* beginning with an entire cluster of people (for instance, every baby born on a particular day) and then tracing the development of some particular characteristic.

For example, prospective studies find the antecedents of heart disease, or child abuse, or high school dropout rates—all of which are much harder to find if the study is *retrospective,* beginning with those who had heart attacks, experienced abuse, or left school. Thus, although retrospective research finds that most high school dropouts say they disliked school, prospective research finds that some who like school still decide to drop out and then later say they hated school, while others dislike school but stay to graduate. Prospective research discovers how many students are in these last two categories; retrospective research on people who have already dropped out does not.

Research Design

Every researcher begins not only by formulating a hypothesis but also by learning what other scientists have discovered about the topic in question and what methods might be useful and ethical in designing research. Often they include measures to guard against inadvertently finding only the results they expect. For example, the people who actually gather the data may not know the purpose of the research. Scientists say that these data gatherers are **blind** to the hypothesized outcome. Participants are sometimes "blind" as well, because otherwise they might, for instance, respond the way they think they should.

blind The condition of data gatherers (and sometimes participants, as well) who are deliberately kept ignorant of the purpose of the research so that they cannot unintentionally bias the results.

Another crucial aspect of research design is to define exactly what is to be studied. Researchers establish an **operational definition** of whatever phenomenon they will be examining, defining each variable by describing specific, observable behavior. This is essential in quantitative research, but it is also useful in qualitative research. For example, if a researcher wants to know when babies begin to walk, does walking include steps taken while holding on? Is one unsteady step enough? Some parents say yes, but the usual operational definition of *walking* is "takes at least three steps without holding on." This operational definition allows comparisons worldwide, making it possible to discover, for example, that well-fed African babies tend to walk earlier than well-fed European babies.

operational definition A description of the specific, observable behavior that will constitute the variable that is to be studied, so that any reader will know whether that behavior occurred or not. Operational definitions may be arbitrary (e.g., an IQ score at or above 130 is operationally defined as "gifted"), but they must be precise.

Operational definitions are difficult to formulate, but they are essential when personality traits are studied. How should *aggression* or *sharing* or *shyness* be defined? Lack of an operational definition leads to contradictory results. For instance, critics report that infant day care makes children more aggressive, but advocates report that it makes them less passive. In this case, both may be seeing the same behavior but defining it differently. For any scientist, operational definitions are crucial, and studies usually include descriptions of how they measured attitudes or behavior.

Reporting Results

You already know that results should be reported in sufficient detail so that another scientist can analyze the conclusions and replicate the research. Various methods, populations, and research designs may produce divergent conclusions. For that reason, handbooks, some journals, and some articles are called *reviews:* They summarize past research. Often, when studies are similar in operational definitions and methods, the review is a **meta-analysis,** which combines the findings of many studies to present an overall conclusion.

meta-analysis A technique of combining results of many studies to come to an overall conclusion. Meta-analysis is powerful, in that small samples can be added together to lead to significant conclusions, although variations from study to study sometimes make combining them impossible.

Table 1.2 (p. 22) describes some statistical measures. One of them is *statistical significance*, which indicates whether or not a particular result could have occurred by chance.

A crucial statistic is **effect size,** a way of measuring how much impact one variable has on another. Effect size ranges from 0 (no effect) to 1 (total transformation, never found in actual studies). Effect size may be particularly important when the sample size is large, because a large sample often leads to highly "significant" results (results that are unlikely to have occurred by chance) that have only a tiny effect on the variable of interest.

effect size A way of indicating statistically how much of an impact the independent variable in an experiment had on the dependent variable.

Hundreds of statistical measures are used by developmentalists. Often the same data can be presented in many ways: Some scientists examine statistical analysis intently before they accept conclusions as valid. A specific example involved methods to improve students' writing ability between grades 4 and 12. A meta-analysis found that many methods of writing instruction have a significant impact, but effect size is much larger for some methods (teaching strategies and summarizing) than for others (prewriting exercises and studying models). For teachers, this statistic is crucial, for they want to know what has a big effect, not merely what is better than chance (significant).

Numerous articles published in the past decade are meta-analyses that combine similar studies to search for general trends. Often effect sizes are also reported, which is especially helpful for meta-analyses since standard calculations almost always find some significance if the number of participants is in the thousands.

Glossary

23rd pair The chromosome pair that, in humans, determines sex. The other 22 pairs are autosomes, inherited equally by males and females.

A

acceleration Educating gifted children alongside other children of the same mental, not chronological, age.

accommodation The restructuring of old ideas to include new experiences.

achievement test A measure of mastery or proficiency in reading, mathematics, writing, science, or some other subject.

adoption A legal proceeding in which an adult or couple is granted the joys and obligations of being a child's parent(s).

affordance An opportunity for perception and interaction that is offered by a person, place, or object in the environment.

age of viability The age (about 22 weeks after conception) at which a fetus might survive outside the mother's uterus if specialized medical care is available.

aggressive-rejected Rejected by peers because of antagonistic, confrontational behavior.

allele A variation that makes a gene different in some way from other genes for the same characteristics. Many genes never vary; others have several possible alleles.

allocare Literally, "other-care"; the care of children by people other than the biological parents.

amygdala A tiny brain structure that registers emotions, particularly fear and anxiety.

animism The belief that natural objects and phenomena are alive.

anoxia A lack of oxygen that, if prolonged, can cause brain damage or death.

antipathy Feelings of dislike or even hatred for another person.

antisocial behavior Actions that are deliberately hurtful or destructive to another person.

Apgar scale A quick assessment of a newborn's health. The baby's color, heart rate, reflexes, muscle tone, and respiratory effort are given a score of 0, 1, or 2 twice—at one minute and five minutes after birth—and each time the total of all five scores is compared with the maximum score of 10 (rarely attained).

apprenticeship in thinking Vygotsky's term for how cognition is stimulated and developed in people by more skilled members of their community.

aptitude The potential to master a specific skill or to learn a certain body of knowledge.

assimilation The reinterpretation of new experiences to fit into old ideas.

assisted reproductive technology (ART) A general term for the techniques designed to help infertile couples conceive and then sustain a pregnancy.

asthma A chronic disease of the respiratory system in which inflammation narrows the airways from the nose and mouth to the lungs, causing difficulty in breathing. Signs and symptoms include wheezing, shortness of breath, chest tightness, and coughing.

attachment According to Ainsworth, "an affectional tie" that an infant forms with a caregiver—a tie that binds them together in space and endures over time.

attention-deficit/hyperactivity disorder (ADHD) A condition characterized by a persistent pattern of inattention and/or by hyperactive or impulsive behaviors; ADHD interferes with a person's functioning or development.

authoritarian parenting An approach to child rearing that is characterized by high behavioral standards, strict punishment for misconduct, and little communication from child to parent.

authoritative parenting An approach to child rearing in which the parents set limits but listen to the child and are flexible.

autism spectrum disorder (ASD) A developmental disorder marked by difficulty with social communication and interaction—including difficulty seeing things from another person's point of view—and restricted, repetitive patterns of behavior, interests, or activities.

automatization A process in which repetition of a sequence of thoughts and actions makes the sequence routine, so that it no longer requires conscious thought.

autonomy versus shame and doubt Erikson's second crisis of psychosocial development. Toddlers either succeed or fail in gaining a sense of self-rule over their actions and their bodies.

axon A fiber that extends from a neuron and transmits electrochemical impulses from that neuron to the dendrites of other neurons.

babbling An infant's repetition of certain syllables, such as *ba-ba-ba*, that begins when babies are between 6 and 9 months old.

bed-sharing When two or more people sleep in the same bed. If one of those people is an infant, some researchers worry that the adult will roll over on the infant.

behavioral teratogens Agents and conditions that can harm the prenatal brain, impairing the future child's intellectual and emotional functioning.

behaviorism A grand theory of human development that studies observable behavior. Behaviorism is also called *learning theory* because it describes the laws and processes by which behavior is learned.

B

Big Five The five basic clusters of personality traits that remain quite stable throughout life: openness, conscientiousness, extroversion, agreeableness, and neuroticism.

bilingual schooling A strategy in which school subjects are taught in both the learner's original language and the second (majority) language.

binocular vision The ability to focus the two eyes in a coordinated manner in order to see one image.

Brazelton Neonatal Behavioral Assessment Scale (NBAS) A test often administered to newborns that measures responsiveness and records 46 behaviors, including 20 reflexes.

bully-victims People who attack others and who are attacked as well. (Also called *provocative victims* because they do things that elicit bullying.)

bullying aggression Unprovoked, repeated physical or verbal attacks, especially on victims who are unlikely to defend themselves.

bullying Repeated, systematic efforts to inflict harm through physical, verbal, or social attack on a weaker person.

C

carrier A person whose genotype includes a gene that is not expressed in the phenotype. The carried gene occurs in half of the carrier's gametes and thus is passed on to half of the carrier's children. If such a gene is inherited from both parents, the characteristic appears in the phenotype.

case study An in-depth study of one person, usually requiring personal interviews to collect background information and various follow-up discussions, tests, questionnaires, and so on.

centration A characteristic of preoperational thought in which a young child focuses (centers) on one idea, excluding all others.

cerebral palsy A disorder that results from damage to the brain's motor centers. People with cerebral palsy have difficulty with muscle control, so their speech and/ or body movements are impaired.

cesarean section (c-section) A surgical birth, in which incisions through the mother's abdomen and uterus allow the fetus to be removed quickly, instead of being delivered through the vagina. (Also called simply *section.*)

charter school A public school with its own set of standards that is funded and licensed by the state or local district in which it is located.

child abuse Deliberate action that impairs a child's physical, emotional, or sexual well-being.

child culture The particular habits, styles, and values that reflect the set of rules and rituals that characterize children as distinct from adult society.

child maltreatment Intentional harm to, or avoidable endangerment of, anyone under 18 years of age.

child neglect Failure to meet a child's basic physical, educational, or emotional needs.

child-directed speech The high-pitched, simplified, and repetitive way adults speak to infants and children. (Also called *baby talk* or *motherese.*)

childhood obesity In a child, having a BMI above the 95th percentile, according to the U.S. Centers for Disease Control's 1980 standards for children of a given age.

childhood overweight In a child, having a BMI above the 85th percentile, according to the U.S. Centers for Disease Control's 1980 standards for children of a given age.

chromosome One of the 46 molecules of DNA (in 23 pairs) that virtually each cell of the human body contains and that, together, contain all the genes. Other species have more or fewer chromosomes.

classical conditioning The learning process in which a meaningful stimulus (such as the smell of food to a hungry animal) is connected with a neutral stimulus (such as the sound of a tone) that had no special meaning before conditioning. (Also called *respondent conditioning.*)

classification The logical principle that things can be organized into groups (or categories or classes) according to some characteristic they have in common.

co-sleeping A custom in which parents and their children (usually infants) sleep together in the same room.

code of ethics A set of moral principles or guidelines that members of a profession or group are expected to follow.

cognitive equilibrium In cognitive theory, a state of mental balance in which people are not confused because they can use their existing thought processes to understand current experiences and ideas.

cognitive theory A grand theory of human development that focuses on changes in how people think over time. According to this theory, our thoughts shape our attitudes, beliefs, and behaviors.

cohort People born within the same historical period who therefore move through life together, experiencing the same events, new technologies, and cultural shifts at the same ages. For example, the effect of the Internet varies depending on what cohort a person belongs to.

comorbid Refers to the presence of two or more unrelated disease conditions at the same time in the same person.

concrete operational thought Piaget's term for the ability to reason logically about direct experiences and perceptions.

conditioning According to behaviorism, the processes by which responses become linked to particular stimuli and learning takes place. The word *conditioning* is used to emphasize the importance of repeated practice, as when an athlete *conditions* his or her body.

conservation The principle that the amount of a substance remains the same (i.e., is conserved) even when its appearance changes.

control processes Mechanisms (including selective attention, metacognition, and emotional regulation) that combine memory, processing speed, and knowledge to regulate the analysis flow of information within the information-processing system. (Also called *executive processes.*)

conventional moral reasoning Kohlberg's second level of moral reasoning, emphasizing social rules.

copy number variations Genes with various repeats or deletions of base pairs.

corporal punishment Punishment that physically hurts the body, such as slapping, spanking, etc.

corpus callosum A long, thick band of nerve fibers that connects the left and right hemispheres of the brain and allows communication between them.

correlation A number between +1.0 and −1.0 that indicates the degree of relationship between two variables, expressed in terms of the likelihood that one variable will (or will not) occur when the other variable does (or does not). A correlation indicates only that two variables are somehow related, not that one variable causes the other to occur.

cortex The outer layers of the brain in humans and other mammals. Most thinking, feeling, and sensing involves the cortex.

cortisol The primary stress hormone; fluctuations in the body's cortisol level affect human emotions.

couvade Symptoms of pregnancy and birth experienced by fathers.

critical period A time when a particular type of developmental growth (in body or behavior) must happen for normal development to occur.

cross-sectional research A research design that compares groups of people who differ in age but are similar in other important characteristics.

cross-sequential research A research design in which researchers first study several groups of people of different ages (a cross-sectional approach) and then follow those groups over the years (a longitudinal approach). (Also called *cohort-sequential research* or *time-sequential research.*)

culture A system of shared beliefs, norms, behaviors, and expectations that persist over time and prescribe social behavior and assumptions.

D

deferred imitation A sequence in which an infant first perceives something done by someone else and then performs the same action hours or even days later.

dendrite A fiber that extends from a neuron and receives electrochemical impulses transmitted from other neurons via their axons.

deoxyribonucleic acid (DNA) The chemical composition of the molecules that contain the genes, which are the chemical instructions for cells to manufacture various proteins.

dependent variable In an experiment, the variable that may change as a result of whatever new condition or situation the experimenter adds. In other words, the dependent variable *depends* on the independent variable.

developmental psychopathology The field that uses insights into typical development to understand and remediate developmental disorders.

developmental theory A group of ideas, assumptions, and generalizations that interpret and illuminate the thousands of observations that have been made about human growth. A developmental theory provides a framework for explaining the patterns and problems of development.

difference-equals-deficit error The mistaken belief that a deviation from some norm is necessarily inferior to behavior or characteristics that meet the standard. Often the "norm" is the standard for the observer, and difference is anyone unlike oneself.

differential susceptibility The idea that people vary in how sensitive they are to particular experiences. Often such differences are genetic, which makes some people affected "for better *and* for worse" by life events. (Also called *differential sensitivity.*)

disorganized attachment A type of attachment that is marked by an infant's inconsistent reactions to the caregiver's departure and return.

distal parenting Caregiving practices that involve remaining distant from the baby, providing toys, food, and face-to-face communication with minimal holding and touching.

dizygotic (DZ) twins Twins who are formed when two separate ova are fertilized by two separate sperm at roughly the same time. (Also called *fraternal* twins.)

dominant–recessive pattern The interaction of a heterozygous pair of alleles in such a way that the phenotype reflects one allele (the dominant gene) more than the other (the recessive gene).

doula Someone who helps with the birth process. Traditionally in Latin America, a doula was the only professional who attended childbirth. Now doulas are likely to arrive at the woman's home during early labor and later work alongside a hospital's staff.

Down syndrome A condition in which a person has 47 chromosomes instead of the usual 46, with 3 rather than 2 chromosomes at the 21st site. People with Down syndrome typically have distinctive characteristics, including unusual facial features, heart abnormalities, and language difficulties. (Also called *trisomy-21.*)

dynamic perception Perception that is primed to focus on movement and change.

dynamic-systems approach A view of human development as an ongoing, ever-changing interaction between the physical, cognitive, and psychosocial influences. The crucial understanding is that development is never static but is always affected by, and affects, many systems of development.

dyscalculia Unusual difficulty with math, probably originating from a distinct part of the brain.

dyslexia Unusual difficulty with reading; thought to be the result of some neurological underdevelopment.

E

eclectic perspective The approach taken by most developmentalists, in which they apply aspects of each of the various theories of development rather than adhering exclusively to one theory.

ecological-systems approach A perspective on human development that considers all the influences from the various contexts of development. (Later renamed *bioecological theory.*)

effortful control The ability to regulate one's emotions and actions through effort, not simply through natural inclination.

egocentrism Piaget's term for children's tendency to think about the world entirely from their own personal perspective.

Electra complex The unconscious desire of girls to replace their mother and win their father's romantic love.

ELLs (English Language Learners) Children in the United States whose proficiency in English is low—usually below a cutoff score on an oral or written test. Many children who speak a non- English language at home are also capable in English; they are *not* ELLs.

embryo The name for a developing human organism from about the third through the eighth week after conception.

embryonic period The stage of prenatal development from approximately the third through the eighth week after conception, during which the basic forms of all body structures, including internal organs, develop.

emotional regulation The ability to control when and how emotions are expressed.

empathy The ability to understand the emotions and concerns of another person, especially when those emotions and concerns differ from one's own.

empirical Based on observation, experience, or experiment; not theoretical.

epigenetics The study of how environmental factors affect genes and genetic expression—enhancing, halting, shaping, or altering the expression of genes and resulting in a phenotype that may differ markedly from the genotype.

equifinality A basic principle of developmental psychopathology that holds that one symptom can have many causes.

ESL (English as a Second Language) A U.S. approach to teaching English that gathers all the non-English speakers together and provides intense instruction in English. Their first language is never used; the goal is to prepare them for regular classes in English.

ethnic group People whose ancestors were born in the same region and who often share a language, culture, and religion.

executive function The cognitive ability to organize and prioritize the many thoughts that arise from the various parts of the brain, allowing the person to anticipate, strategize, and plan behavior.

experience-dependent brain functions Brain functions that depend on particular, variable experiences and that therefore may or may not develop in a particular infant.

experience-expectant brain functions Brain functions that require certain basic common experiences (which an infant can be expected to have) in order to develop normally.

experiment A method to determine cause and effect. Researchers control the participants and the interventions, which makes it easier to understand what causes what, for whom.

extended family A family of three or more generations living in one household.

externalizing problems Difficulty with emotional regulation that involves expressing powerful feelings through uncontrolled physical or verbal outbursts, as by lashing out at other people or breaking things.

extremely low birthweight (ELBW) A body weight at birth of less than 2 pounds, 3 ounces (1,000 grams).

extrinsic motivation A drive, or reason to pursue a goal, that arises from the need to have one's achievements rewarded from outside, perhaps by receiving material possessions or another person's esteem.

F

failure to thrive A serious medical condition in early infancy, when the baby does not gain weight as rapidly as he or she is expected to.

false positive The result of a laboratory test that reports something as true when in fact it is not true. This can occur for pregnancy tests, when a woman might not be pregnant even though the test says she is, or during pregnancy when a problem is reported that actually does not exist.

family function The way a family works to meet the needs of its members. Children need families to provide basic material necessities, to encourage learning, to help them develop self-respect, to nurture friendships, and to foster harmony and stability.

family structure The legal and genetic relationships among relatives; includes nuclear family, extended family, stepfamily, and so on.

fast-mapping The speedy and sometimes imprecise way in which children learn new words by tentatively placing them in mental categories according to their perceived meaning.

fetal alcohol syndrome (FAS) A cluster of birth defects, including abnormal facial characteristics, slow physical growth, and reduced intellectual ability, that may occur in the fetus of a woman who drinks alcohol while pregnant.

fetal period The stage of prenatal development from the ninth week after conception until birth, during which the fetus gains about 7 pounds (more than 3,000 grams) and organs become more mature, gradually able to function on their own.

fetus The name for a developing human organism from the start of the ninth week after conception until birth.

fine motor skills Physical abilities involving small body movements, especially of the hands and fingers, such as drawing and picking up a coin. (The word *fine* here means "small.")

Flynn effect The rise in average IQ scores that has occurred over the decades in many nations.

fMRI Functional magnetic resonance imaging, a measuring technique in which the brain's electrical excitement indicates activation anywhere in the brain; fMRI helps researchers locate neurological responses to stimuli.

focus on appearance A characteristic of preoperational thought in which a young child ignores all attributes that are not apparent.

foster care A legal, publicly supported system in which a maltreated child is removed from the parents' custody and entrusted to another adult or family. Foster care providers are reimbursed for expenses incurred in meeting the child's needs.

fragile X syndrome A genetic disorder in which part of the X chromosome seems to be attached to the rest of it by a very thin string of molecules. The cause is a single gene that has more than 200 repetitions of one triplet.

G

gamete A reproductive cell; that is, a sperm or ovum that can produce a new individual if it combines with a gamete from the other sex to make a zygote.

gender differences Differences in the roles and behaviors of males and females that are prescribed by the culture.

gender schema A cognitive concept or general belief based on one's experiences in this case, a child's understanding of sex differences.

gene A small section of a chromosome; the basic unit for the transmission of heredity. A gene consists of a string of chemicals that provide instructions for the cell to manufacture certain proteins.

genetic counseling Consultation and testing by trained experts that enables individuals to learn about their genetic heritage, including harmful conditions that they might pass along to any children they may conceive.

genome The full set of genes that are the instructions to make an individual member of a certain species.

genotype An organism's entire genetic inheritance, or genetic potential.

germinal period The first two weeks of prenatal development after conception, characterized by rapid cell division and the beginning of cell differentiation.

goodness of fit A similarity of temperament and values that produces a smooth interaction between an individual and his or her social context, including family, school, and community.

grammar All the methods—word order, verb forms, and so on—that languages use to communicate meaning, apart from the words themselves.

gross motor skills Physical abilities involving large body movements, such as walking and jumping. (The word *gross* here means "big.")

guided participation The process by which people learn from others who guide their experiences and explorations. This learning is direct and interactive.

H

habituation The process of becoming accustomed to an object or event through repeated exposure to it, and thus becoming less interested in it.

Head Start A federally funded early-childhood intervention program for low-income children of preschool age.

head-sparing A biological mechanism that protects the brain when malnutrition disrupts body growth. The brain is the last part of the body to be damaged by malnutrition.

heritability A statistic that indicates what percentage of the variation in a particular trait within a particular population, in a particular context and era, can be traced to genes.

heterozygous Referring to two genes of one pair that differ in some way. Typically one allele has only a few base pairs that differ from the other member of the pair.

hidden curriculum The unofficial, unstated, or implicit rules and priorities that influence the academic curriculum and every other aspect of learning in a school.

hippocampus A brain structure that is a central processor of memory, especially memory for locations.

holophrase A single word that is used to express a complete, meaningful thought.

home schooling Education in which children are taught at home, usually by their parents.

homozygous Referring to two genes of one pair that are exactly the same in every letter of their code. Most gene pairs are homozygous.

Human Genome Project An international effort to map the complete human genetic code. This effort was essentially completed in 2001, though analysis is ongoing.

humanism A theory that stresses the potential of all humans for good and the belief that all people have the same basic needs, regardless of culture, gender, or background.

hypothalamus A brain area that responds to the amygdala and the hippocampus to produce hormones that activate other parts of the brain and body.

hypothesis A specific prediction that can be tested.

I

identification An attempt to defend one's self-concept by taking on the behaviors and attitudes of someone else.

imaginary friends Make-believe friends who exist only in a child's imagination; increasingly common from ages 3 through 7. They combat loneliness and aid emotional regulation.

immersion A strategy in which instruction in all school subjects occurs in the second (usually the majority) language that a child is learning.

immigrant paradox The surprising, paradoxical fact that low SES immigrant women tend to have fewer birth complications than native-born peers with higher incomes.

immunization A process that stimulates the body's immune system by causing production of antibodies to defend against attack by a particular contagious disease. Creation of antibodies may be accomplished either naturally (by having the disease), by injection, by drops that are swallowed, or by a nasal spray. (These imposed methods are also called vaccination.)

implantation The process, beginning about 10 days after conception, in which the developing organism burrows into the placenta that lines the uterus, where it can be nourished and protected as it continues to develop.

impulse control The ability to postpone or deny the immediate response to an idea or behavior.

in vitro fertilization (IVF) Fertilization that takes place outside a woman's body (as in a glass laboratory dish). The procedure involves mixing sperm with ova that have been surgically removed from the woman's ovary. If a zygote is produced, it is inserted into a woman's uterus, where it may implant and develop into a baby.

independent variable In an experiment, the variable that is introduced to see what effect it has on the dependent variable. (Also called *experimental variable*.)

individual education plan (IEP) A document that specifies educational goals and plans for a child with special needs.

induction A disciplinary technique in which the parent tries to get the child to understand why a certain behavior was wrong. Listening, not lecturing, is crucial."

industry versus inferiority The fourth of Erikson's eight psychosocial crises, during which children attempt to master many skills, developing a sense of themselves as either industrious or inferior, competent or incompetent.

information-processing theory A perspective that compares human thinking processes, by analogy, to computer analysis of data, including sensory input, connections, stored memories, and output.

information-processing theory A perspective that compares human thinking processes, by analogy, to computer analysis of data, including sensory input connections, stored memories, and output.

initiative versus guilt Erikson's third psychosocial crisis, in which children undertake new skills and activities and feel guilty when they do not succeed at them.

injury control/harm reduction Practices that are aimed at anticipating, controlling, and preventing dangerous activities. These practices reflect the beliefs that accidents are not random and that injuries can be made less harmful if proper controls are in place.

insecure-avoidant attachment A pattern of attachment in which an infant avoids connection with the caregiver. The infant seems not to care about the caregiver's presence, departure, or return.

insecure-resistant/ambivalent attachment A pattern of attachment in which an infant's anxiety and uncertainty are evident, as when the infant becomes very upset at separation from the caregiver and both resists and seeks contact on reunion.

instrumental aggression Behavior that hurts someone else because the aggressor wants to get or keep a possession or a privilege.

internalizing problems Difficulty with emotional regulation that involves turning one's emotional distress inward, as by feeling excessively guilty, ashamed, or worthless.

intra-cytoplasmic sperm injection (ICSI) An in vitro fertilization technique in which a single sperm cell is injected directly into an ovum.

intrinsic motivation A drive, or reason to pursue a goal, that comes from inside a person, such as the desire to feel smart or competent.

irreversibility A characteristic of preoperational thought in which a young child thinks that nothing can be undone. A thing cannot be restored to the way it was before a change occurred.

K

kangaroo care A form of newborn care in which mothers (and sometimes fathers) rest their babies on their naked chests, like kangaroo mothers that carry their immature newborns in a pouch on their abdomen.

kinship care A form of foster care in which a relative of a maltreated child, usually a grandparent, becomes the approved caregiver.

knowledge base A body of knowledge in a particular area that makes it easier to master new information in that area.

kwashiorkor A disease of chronic malnutrition during childhood, in which a protein deficiency makes the child more vulnerable to other diseases, such as measles, diarrhea, and influenza.

L

language acquisition device (LAD) Chomsky's term for a hypothesized mental structure that enables humans to learn language, including the basic aspects of grammar, vocabulary, and intonation.

latency Freud's term for middle childhood, during which children's emotional drives and psychosexual needs are quiet (latent). Freud thought that sexual conflicts from earlier stages are only temporarily submerged, bursting forth again at puberty.

lateralization Literally, "sidedness," referring to the specialization in certain functions by each side of the brain, with one side dominant for each activity. The left side of the brain controls the right side of the body, and vice versa.

least restrictive environment (LRE) A legal requirement that children with special needs be assigned to the most general educational context in which they can be expected to learn.

"little scientist" The stage-five toddler (age 12 to 18 months) who experiments without anticipating the results, using trial and error in active and creative exploration.

long-term memory The component of the information-processing system in which virtually limitless amounts of information can be stored indefinitely.

longitudinal research A research design in which the same individuals are followed over time, as their development is repeatedly assessed.

low birthweight (LBW) A body weight at birth of less than 5. pounds (2,500 grams).

M

marasmus A disease of severe protein-calorie malnutrition during early infancy, in which growth stops, body tissues waste away, and the infant eventually dies.

mean length of utterance (MLU) The average number of words and meaningful sounds (such as *-ing* and *huh?*) in a typical sentence (called utterance, because children may not talk in complete sentences). MLU is often used to indicate how advanced a child's language development is.

metacognition "Thinking about thinking," or the ability to evaluate a cognitive task in order to determine how best to accomplish it, and then to monitor and adjust one's performance on that task.

middle childhood The period between early childhood and early adolescence, approximately from ages 6 to 11.

modeling The central process of social learning, by which a person observes the actions of others and then copies them.

monozygotic (MZ) twins Twins who originate from one zygote that splits apart very early in development. (Also called *identical twins*.) Other monozygotic multiple births (such as triplets and quadruplets) can occur as well.

Montessori schools Schools that offer early-childhood education based on the philosophy of Maria Montessori, which emphasizes careful work and tasks that each young child can do.

motor skills The learned abilities to move some part of the body, in actions ranging from a large leap to a flicker of the eyelid. (The word *motor* here refers to movement of muscles.)

multifactorial Referring to a trait that is affected by many factors, both genetic and environmental, that enhance, halt, shape, or alter the expression of genes, resulting in a phenotype that may differ markedly from the genotype.

multifinality A basic principle of developmental psychopathology that holds that one cause can have many (multiple) final manifestations.

multiple intelligences The idea that human intelligence is composed of a varied set of abilities rather than a single, all-encompassing one.

myelination The process by which axons become coated with myelin, a fatty substance that speeds the transmission of nerve impulses from neuron to neuron.

N

naming explosion A sudden increase in an infant's vocabulary, especially in the number of nouns, that begins at about 18 months of age.

National Assessment of Educational Progress (NAEP) An ongoing and nationally representative measure of U.S. children's achievement in reading, mathematics, and other subjects over time; nicknamed "the Nation's Report Card."

nature In development, nature refers to the traits, capacities, and limitations that each individual inherits genetically from his or her parents at the moment of conception.

neglectful/uninvolved parenting An approach to child rearing in which the parents are indifferent toward their children and unaware of what is going on in their children's lives.

neurodiversity The idea that people have diverse brain structures, with each person having neurological strengths and weaknesses that should be appreciated, in much the same way diverse cultures and ethnicities are welcomed. A person who is adept at numbers and systems but inept in social skills and metaphors might be recognized as having unusual gifts, rather than pitied for having an autism spectrum disorder.

neuron One of billions of nerve cells in the central nervous system, especially in the brain.

neurotransmitter A brain chemical that carries information from the axon of a sending neuron to the dendrites of a receiving neuron.

No Child Left Behind Act A U.S. law enacted in 2001 that was intended to increase accountability in education by requiring states to qualify for federal educational funding by administering standardized tests to measure school achievement.

norm An average, or typical, standard of behavior or accomplishment, such as the norm for age of walking or the norm for greeting a stranger.

nuclear family A family that consists of a father, a mother, and their biological children under age 18.

nurture In development, nurture includes all the environmental influences that affect the individual after conception. This includes everything from the mother's nutrition while pregnant to the implicit values of the nation.

O

object permanence The realization that objects (including people) still exist when they can no longer be seen, touched, or heard.

Oedipus complex The unconscious desire of young boys to replace their father and win their mother's romantic love.

operant conditioning The learning process by which a particular action is followed by something desired (which makes the person or animal more likely to repeat the action) or by something unwanted (which makes the action less likely to be repeated). (Also called *instrumental conditioning.*)

overimitation When a person imitates an action that is not a relevant part of the behavior to be learned. Overimitation is common among 2- to 6-year-olds when they imitate adult actions that are unnecessary.

overregularization The application of rules of grammar even when exceptions occur, making the language seem more "regular" than it actually is.

P

parent–infant bond The strong, loving connection that forms as parents hold, examine, and feed their newborn.

parental alliance Cooperation between a mother and a father based on their mutual commitment to their children. In a parental alliance, the parents support each other in their shared parental roles.

people preference A universal principle of infant perception, specifically an innate attraction to other humans, evident in visual, auditory, and other preferences.

percentile A point on a ranking scale of 0 to 100. The 50th percentile is the midpoint; half the people in the population being studied rank higher and half rank lower.

perception The mental processing of sensory information when the brain interprets a sensation.

permanency planning An effort by child-welfare authorities to find a long-term living situation that will provide stability and support for a maltreated child. A goal is to avoid repeated changes of caregiver or school, which can be harmful to the child.

permissive parenting An approach to child rearing that is characterized by high nurturance and communication but little discipline, guidance, or control. (Also called *indulgent parenting.*)

perseveration The tendency to persevere in, or stick to, one thought or action for a long time.

phallic stage Freud's third stage of development, when the penis becomes the focus of concern and pleasure.

phenotype The observable characteristics of a person, including appearance, personality, intelligence, and all other traits.

plasticity The idea that abilities, personality, and other human characteristics can change over time. Plasticity is particularly evident during childhood, but even older adults are not always "set in their ways."

polygamous family A family consisting of one man, several wives, and their children.

polygenic Referring to a trait that is influenced by many genes.

post-traumatic stress disorder (PTSD) An anxiety disorder that develops after a profoundly shocking or frightening event, such as rape, severe beating, war, or natural disaster. Symptoms may include flashbacks to the event, hyperactivity and hypervigilance, displaced anger, sleeplessness, nightmares, sudden terror or anxiety, and confusion between fantasy and reality.

postconventional moral reasoning Kohlberg's third level of moral reasoning, emphasizing moral principles.

postpartum depression A new mother's feelings of inadequacy and sadness in the days and weeks after giving birth.

pragmatics The practical use of language that includes the ability to adjust language communication according to audience and context.

preconventional moral reasoning Kohlberg's first level of moral reasoning, emphasizing rewards and punishments.

prefrontal cortex The area of the cortex at the very front of the brain that specializes in anticipation, planning, and impulse control.

preoperational intelligence Piaget's term for cognitive development between the ages of about 2 and 6; it includes language and imagination (which involve symbolic thought), but logical, operational thinking is not yet possible at this stage.

preterm A birth that occurs 3 or more weeks before the full 38 weeks of the typical pregnancy—that is, at 35 or fewer weeks after conception.

primary circular reactions The first of three types of feedback loops in sensorimotor intelligence, this one involving the infant's own body. The infant senses motion, sucking, noise, and other stimuli and tries to understand them.

primary prevention Actions that change overall background conditions to prevent harm.

private school A school funded by tuition charges, endowments, and often religious or other nonprofit sponsors.

private speech The internal dialogue that occurs when people talk to themselves (either silently or out loud).

Progress in International Reading Literacy Study (PIRLS) Inaugurated in 2001, a planned five-year cycle of international trend studies in the reading ability of fourth-graders.

prosocial behavior Actions that are helpful and kind but are of no obvious benefit to oneself.

protein-calorie malnutrition A condition in which a person does not consume sufficient food of any kind. This deprivation can result in several illnesses, severe weight loss, and even death.

proximal parenting Caregiving practices that involve being physically close to the baby, with frequent holding and touching.

pruning When applied to brain development, the process by which unused connections in the brain atrophy and die.

psychoanalytic theory A grand theory of human development that holds that irrational, unconscious drives and motives, often originating in childhood, underlie human behavior.

psychological control A disciplinary technique that involves threatening to withdraw love and support and that relies on a child's feelings of guilt and gratitude to the parents.

psychopathology Literally, an illness of the mind, or psyche. Various cultures and groups within cultures have different concepts of specific psychopathologies. A recent compendium of symptoms and disorders in the United States is in the DSM-5. Many other nations use an international set of categories, the ICD-10.

R

race A group of people who are regarded by themselves or by others as distinct from other groups on the basis of physical appearance, typically skin color. Social scientists think race is a misleading concept, as biological differences are not signified by outward appearance.

reaction time The time it takes to respond to a stimulus, either physically (with a reflexive movement such as an eyeblink) or cognitively (with a thought).

reactive aggression An impulsive verbal or physical retaliation for another person's intentional or accidental action.

reflex An unlearned, involuntary action or movement in response to a stimulus. A reflex occurs without conscious thought.

Reggio Emilia A program of early-childhood education that originated in the town of Reggio Emilia, Italy, and that encourages each child's creativity in a carefully designed setting.

reinforcement When a behavior is followed by something desired, such as food for a hungry animal or a welcoming smile for a lonely person.

relational aggression Nonphysical acts, such as insults or social rejection, aimed at harming the social connection between the victim and other people.

REM (rapid eye movement) sleep A stage of sleep characterized by flickering eyes behind closed lids, dreaming, and rapid brain waves.

reminder session A perceptual experience that helps a person recollect an idea, a thing, or an experience.

replication Repeating a study, usually using different participants.

reported maltreatment Harm or endangerment about which someone has notified the authorities.

resilience The capacity to adapt well to significant adversity and to overcome serious stress.

response to intervention (RTI) An educational strategy intended to help children who demonstrate below-average achievement in early grades, using special intervention.

rough-and-tumble play Play that mimics aggression through wrestling, chasing, or hitting, but in which there is no intent to harm.

S

scaffolding Temporary support that is tailored to a learner's needs and abilities and aimed at helping the learner master the next task in a given learning process.

science of human development The science that seeks to understand how and why people of all ages and circumstances change or remain the same over time.

scientific method A way to answer questions using empirical research and data-based conclusions.

scientific observation A method of testing a hypothesis by unobtrusively watching and recording participants' behavior in a systematic and objective manner—in a natural setting, in a laboratory, or in searches of archival data.

secondary circular reactions The second of three types of feedback loops in sensorimotor intelligence, this one involving people and objects. Infants respond to other people, to toys, and to any other object they can touch or move.

secondary prevention Actions that avert harm in a high-risk situation, such as holding a child's hand while crossing the street.

secure attachment A relationship in which an infant obtains both comfort and confidence from the presence of his or her caregiver.

selective adaptation The process by which living creatures (including people) adjust to their environment. Genes that enhance survival and reproductive ability are selected, over the generations, to become more prevalent.

selective attention The ability to concentrate on some stimuli while ignoring others.

self-awareness A person's realization that he or she is a distinct individual whose body, mind, and actions are separate from those of other people.

self-concept A person's understanding of who he or she is, in relation to self-esteem, appearance, personality, and various traits.

self-righting The inborn drive to remedy a developmental deficit; literally, to return to sitting or standing upright after being tipped over. People of all ages have self-righting impulses, seeking emotional as well as physical balance.

sensation The response of a sensory system (eyes, ears, skin, tongue, nose) when it detects a stimulus.

sensitive period A time when a certain type of development is most likely, although it may still happen later with more difficulty. For example, early childhood is considered a sensitive period for language learning.

sensorimotor intelligence Piaget's term for the way infants think—by using their senses and motor skills—during the first period of cognitive development.

sensory memory The component of the information-processing system in which incoming stimulus information is stored for a split second to allow it to be processed. Also called the *sensory register*.

separation anxiety An infant's distress when a familiar caregiver leaves, most obvious between 9 and 14 months.

seriation The concept that things can be arranged in a logical series, such as the number sequence or the alphabet.

sex differences Biological differences between males and females, in organs, hormones, and body type.

shaken baby syndrome A life-threatening injury that occurs when an infant is forcefully shaken back and forth, a motion that ruptures blood vessels in the brain and breaks neural connections.

single-parent family A family that consists of only one parent and his or her biological children under age 18.

small for gestational age (SGA) Also called *small-for-dates*.) A term for a baby whose birthweight is significantly lower than expected, given the time since conception. For example, a 5-pound (2,265-gram) newborn is considered SGA if born on time but not SGA if born two months early.

social comparison The tendency to assess one's abilities, achievements, social status, and other attributes by measuring them against those of other people, especially one's peers.

social construction An idea that is built on shared perceptions, not on objective reality. Many age-related terms, such as *childhood, adolescence, yuppie,* and *senior citizen,* are social constructions, strongly influenced by social assumptions.

social learning The acquisition of behavior patterns by observing the behavior of others.

social learning theory An extension of behaviorism that emphasizes the influence that other people have over a person's behavior. Even without specific reinforcement, every individual learns through observation and imitation of other people. Also called *observational learning.*

social mediation Human interaction that expands and advances understanding, often through words that one person uses to explain something to another.

social referencing Seeking information about how to react to an unfamiliar or ambiguous object or event by observing someone else's expressions and reactions. That other person becomes a social reference.

social smile A smile evoked by a human face, normally first evident in infants about 6 weeks after birth.

sociocultural theory A newer theory that holds that development results from the dynamic interaction of each person with the surrounding social and cultural forces.

sociodramatic play Pretend play in which children act out various roles and themes in stories that they create.

socioeconomic status (SES) A person's position in society as determined by income, occupation, education, and place of residence. Sometimes called *social class.*

specific learning disorder (learning disability) A marked deficit in a particular area of learning that is not caused by an apparent physical disability, by an intellectual disability, or by an unusually stressful home environment.

static reasoning A characteristic of preoperational thought in which a young child thinks that nothing changes. Whatever is now has always been and always will be.

stem cells Cells from which any other specialized type of cell can form.

still-face technique An experimental practice in which an adult keeps his or her face unmoving and expressionless in face-to-face interaction with an infant.

Strange Situation A laboratory procedure for measuring attachment by evoking infants' reactions to the stress of various adults comings and goings in an unfamiliar playroom.

stranger wariness An infant's expression of concern—a quiet stare while clinging to a familiar person, or a look of fear—when a stranger appears.

stunting The failure of children to grow to a normal height for their age due to severe and chronic malnutrition.

substantiated maltreatment Harm or endangerment that has been reported, investigated, and verified.

sudden infant death syndrome (SIDS) A situation in which a seemingly healthy infant, usually between 2 and 6 months old, suddenly stops breathing and dies unexpectedly while asleep.

superego In psychoanalytic theory, the judgmental part of the personality that internalizes the moral standards of the parents.

survey A research method in which information is collected from a large number of people by interviews, written questionnaires, or some other means.

symbolic thought A major accomplishment of preoperational intelligence that allows a child to think symbolically, including understanding that words can refer to things not seen and that an item, such as a flag, can symbolize something else—in this case, a country.

synapse The intersection between the axon of one neuron and the dendrites of other neurons.

synaptic gap The pathway across which neurotransmitters carry information from the axon of the sending neuron to the dendrites of the receiving neuron.

synchrony A coordinated, rapid, and smooth exchange of responses between a caregiver and an infant.

T

temperament Inborn differences between one person and another in emotions, activity, and self-regulation. It is measured by the person's typical responses to the environment.

teratogen An agent or condition, including viruses, drugs, and chemicals, that can impair prenatal development and result in birth defects or even death.

tertiary circular reactions The third of three types of feedback loops in sensorimotor intelligence, this one involving active exploration and experimentation. Infants explore a range of new activities, varying their responses as a way of learning about the world.

tertiary prevention Actions, such as immediate and effective medical treatment, that reduce harm or prevent disability after injury.

theory A comprehensive set of ideas.

theory of mind A person's theory of what other people might be thinking. In order to have a theory of mind, children must realize that other people are not necessarily thinking the same thoughts that they themselves are. That realization seldom occurs before age 4.

theory-theory The idea that children attempt to explain everything they see and hear by constructing theories.

threshold effect In prenatal development, when a teratogen is relatively harmless in small doses but becomes harmful once exposure reaches a certain level (the threshold).

time-out A disciplinary technique in which a child is separated from other people for a specified time.

transient exuberance The great but temporary increase in the number of dendrites that develop in an infant's brain during the first two years of life.

Trends in Math and Science Study (TIMSS) An international assessment of the math and science skills of fourth- and eighth-graders. Although the TIMSS is very useful, different countries' scores are not always comparable because sample selection, test administration, and content validity are hard to keep uniform.

trust versus mistrust Erikson's first crisis of psychosocial development. Infants learn basic trust if the world is a secure place where their basic needs (for food, comfort, attention, and so on) are met.

U

ultrasound An image of a fetus (or an internal organ) produced by using high-frequency sound waves. (Also called *sonogram.*)

V

very low birthweight (VLBW) A body weight at birth of less than 3 pounds, 5 ounces (1,500 grams).

visual cliff An experimental apparatus that gives the illusion of a sudden drop-off between one horizontal surface and another.

voucher A public subsidy for tuition payment at a nonpublic school. Vouchers vary a great deal from place to place, not only in amount and availability but also in restrictions as to who gets them and what schools accept them.

W

wasting The tendency for children to be severely underweight for their age as a result of malnutrition.

withdrawn-rejected Rejected by peers because of timid, withdrawn, and anxious behavior.

working memory The component of the information-processing system in which current conscious mental activity occurs. (Formerly called *short-term memory*.)

working model In cognitive theory, a set of assumptions that the individual uses to organize perceptions and experiences. For example, a person might assume that other people are trustworthy and be surprised by an incident in which this working model of human behavior is erroneous.

X

X-linked A gene carried on the X chromosome. If a male inherits an X-linked recessive trait from his mother, he expresses that trait because the Y from his father has no counteracting gene. Females are more likely to be carriers of X-linked traits but are less likely to express them.

XX A 23rd chromosome pair that consists of two X-shaped chromosomes, one each from the mother and the father. XX zygotes become females.

XY A 23rd chromosome pair that consists of an X-shaped chromosome from the mother and a Y-shaped chromosome from the father. XY zygotes become males.

Z

zone of proximal development In sociocultural theory, a metaphorical area, or "zone," surrounding a learner that includes all the skills, knowledge, and concepts that the person is close ("proximal") to acquiring but cannot yet master without help.

zygote The single cell formed from the union of two gametes, a sperm and an ovum.

References

Aarnoudse-Moens, Cornelieke S. H.; Smidts, Diana P.; Oosterlaan, Jaap; Duivenvoorden, Hugo J. & Weisglas-Kuperus, Nynke. (2009). Executive function in very preterm children at early school age. *Journal of Abnormal Child Psychology*, 37(7), 981–993. doi: 10.1007/s10802-009-9327-z

Abela, Angela & Walker, Janet (Eds.). (2014). *Contemporary issues in family studies: Global perspectives on partnerships, parenting and support in a changing world*. Malden, MA: Wiley.

Abreu, Guida de. (2008). From mathematics learning out-of-school to multicultural classrooms: A cultural psychology perspective. In Lyn D. English (Ed.), *Handbook of international research in mathematics education* (2nd ed., pp. 323–353). New York, NY: Routledge.

Accardo, Pasquale. (2006). Who's training whom? *The Journal of Pediatrics*, *149*(2), 151–152. doi: 10.1016/j.jpeds.2006.04.026

Adamson, Lauren B. & Bakeman, Roger. (2006). Development of displaced speech in early mother-child conversations. *Child Development*, *77*(1), 186–200. doi: 10.1111/j.1467-8624.2006.00864.x

Adamson, Lauren B.; Bakeman, Roger; Deckner, Deborah F. & Nelson, P. Brooke. (2014). From interactions to conversations: The development of joint engagement during early childhood. *Child Development*, 85(3), 941–955. doi: 10.1111/cdev.12189

Adolph, Karen E. & Berger, Sarah E. (2005). Physical and motor development. In Marc H. Bornstein & Michael E. Lamb (Eds.), *Developmental science: An advanced textbook* (5th ed., pp. 223–281). Mahwah, NJ: Lawrence Erlbaum Associates.

Adolph, Karen E.; Cole, Whitney G.; Komati, Meghana; Garciaguirre, Jessie S.; Badaly, Daryaneh; Lingeman, Jesse M., . . . Sotsky, Rachel B. (2012). How do you learn to walk? Thousands of steps and dozens of falls per day. *Psychological Science*, *23*(11), 1387–1394. doi: 10.1177/0956797612446346

Adolph, Karen E. & Kretch, Kari S. (2012). Infants on the edge: Beyond the visual cliff. In Alan M. Slater & Paul C. Quinn (Eds.), *Developmental psychology: Revisiting the classic studies*. Thousand Oaks, CA: Sage.

Adolph, Karen E. & Robinson, Scott. (2013). The road to walking: What learning to walk tells us about development. In Philip D. Zelazo (Ed.), *The Oxford handbook of developmental psychology* (Vol. 1, pp. 402–447). New York, NY: Oxford University Press.

Adolph, Karen E.; Vereijken, Beatrix & Shrout, Patrick E. (2003). What changes in infant walking and why. *Child Development*, *74*(2), 475–497. doi: 10.1111/1467-8624.7402011

Ahmed, Parvez & Jaakkola, Jouni J. K. (2007). Maternal occupation and adverse pregnancy outcomes: A Finnish population-based study. *Occupational Medicine*, *57*(6), 417–423. doi: 10.1093/occmed/kqm038

Ainsworth, Mary D. Salter. (1967). *Infancy in Uganda: Infant care and the growth of love*. Baltimore, MD: Johns Hopkins Press.

Ainsworth, Mary D. Salter. (1973). The development of infant-mother attachment. In Bettye M. Caldwell & Henry N. Ricciuti (Eds.), *Child development and social policy* (pp. 1–94). Chicago, IL: University of Chicago Press.

Akhtar, Nameera & Jaswal, Vikram K. (2013). Deficit or difference? Interpreting diverse developmental paths: An introduction to the special section. *Developmental Psychology*, *49*(1), 1–3. doi: 10.1037/a0029851

Aksglaede, Lise; Link, Katarina; Giwercman, Aleksander; Jørgensen, Niels; Skakkebæk, Niels E. & Juul, Anders. (2013). 47,XXY Klinefelter syndrome: Clinical characteristics and age-specific recommendations for medical management. *American Journal of Medical Genetics Part C: Seminars in Medical Genetics*, *163*(1), 55–63. doi: 10.1002/ajmg.c.31349

Al-Namlah, Abdulrahman S.; Meins, Elizabeth & Fernyhough, Charles. (2012). Self-regulatory private speech relates to children's recall and organization of autobiographical memories. *Early Childhood Research Quarterly*, *27*(3), 441–446. doi: 10.1016/j.ecresq.2012.02.005

Al-Yagon, Michal; Cavendish, Wendy; Cornoldi, Cesare; Fawcett, Angela J.; Grünke, Matthias; Hung, Li-Yu, . . . Vio, Claudio. (2013). The proposed changes for DSM-5 for SLD and ADHD: International perspectives–Australia, Germany, Greece, India, Israel, Italy, Spain, Taiwan, United Kingdom, and United States. *Journal of Learning Disabilities*, *46*(1), 58–72. doi: 10.1177/0022219412464353

Alegre, Alberto. (2011). Parenting styles and children's emotional intelligence: What do we know? *The Family Journal*, *19*(1), 56–62. doi: 10.1177/1066480710387486

Alkire, Blake C.; Vincent, Jeffrey R.; Burns, Christy T.; Metzler, Ian S.; Farmer, Paul E. & Meara, John G. (2012). Obstructed labor and caesarean delivery: The cost and benefit of surgical intervention. *PLoS ONE*, *7*(4), e34595. doi: 10.1371/journal.pone.0034595

Allen, Kathleen P. (2010). A bullying intervention system in high school: A two-year school-wide follow-up. *Studies In Educational Evaluation*, *36*(3), 83–92. doi: 10.1016/j.stueduc.2011.01.002

Almomani, Basima; Hawwa, Ahmed F.; Millership, Jeffrey S.; Heaney, Liam; Douglas, Isabella; McElnay, James C. & Shields, Michael D. (2013). Can certain genotypes predispose to poor asthma control in children? A pharmacogenetic study of 9 candidate genes in children with difficult asthma. *PLoS ONE*, *8*(4), e60592. doi: 10.1371/journal.pone.0060592

Almond, Douglas. (2006). Is the 1918 influenza pandemic over? Long-term effects of in utero influenza exposure in the post-1940 U.S. population. *Journal of Political Economy*, *114*(4), 672–712. doi: 10.1086/507154

Alper, Meryl. (2013). Developmentally appropriate New Media Literacies: Supporting cultural competencies and social skills in early childhood education. *Journal of Early Childhood Literacy*, *13*(2), 175–196. doi: 10.1177/1468798411430101

Alviola, Pedro A.; Nayga, Rodolfo M. & Thomsen, Michael. (2013). Food deserts and childhood obesity. *Applied Economic Perspectives and Policy*, *35*(1), 106–124. doi: 10.1093/aepp/pps035

Amato, Michael S.; Magzamen, Sheryl; Imm, Pamela; Havlena, Jeffrey A.; Anderson, Henry A.; Kanarek, Marty S. & Moore, Colleen F. (2013). Early lead exposure (<3 years old) prospectively predicts fourth grade school suspension in Milwaukee, Wisconsin (USA). *Environmental Research*, *126*, 60–65. doi: 10.1016/j.envres.2013.07.008

Ambady, Nalini & Bharucha, Jamshed. (2009). Culture and the brain. *Current Directions in Psychological Science*, *18*(6), 342–345. doi: 10.1111/j.1467-8721.2009.01664.x

American College of Obstetricians and Gynecologists Committee on Obstetric Practice. (2011). Committee opinion no. 476: Planned home birth. *Obstetrics & Gynecology*, *117*(2), 425–428. doi: 10.1097/AOG.0b013e31820ceec20

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders: DSM-5* (5th ed.). Washington, DC: American Psychiatric Association.

American Psychological Association. (2010). Ethical principles of psychologists and code of conduct. Including 2010 amendments. http://www.apa.org/ethics/code/index.aspx

Anderson, Robert N.; Kochanek, Kenneth D. & Murphy, Sherry L. (1997). *Report of final mortality statistics, 1995*. Hyattsville, MD: Centers for Disease Control and Prevention, National Center for Health Statistics. *45*(11, Suppl. 2).

Andrews, Nick; Miller, Elizabeth; Grant, Andrew; Stowe, Julia; Osborne, Velda & Taylor, Brent. (2004). Thimerosal exposure in infants and developmental disorders: A retrospective cohort study in the United Kingdom does not support a causal association. *Pediatrics, 114*(3), 584–591. doi: 10.1542/peds.2003-1177-L

Ansary, Nadia S. & Luthar, Suniya S. (2009). Distress and academic achievement among adolescents of affluence: A study of externalizing and internalizing problem behaviors and school performance. *Development and Psychopathology, 21*(1), 319–341. doi: 10.1017/S0954579409000182

Antenucci, Antonio. (2013, November 26). Cop who bought homeless man boots promoted. *New York Post*.

Antoine, Michelle W.; Hübner, Christian A; Arezzo, Joseph C. & Hébert, Jean M. (2013). A causative link between inner ear defects and long-term striatal dysfunction. *Science, 341*(6150), 1120–1123. doi: 10.1126/science.1240405

Apgar, Virginia. (1953). A proposal for a new method of evaluation of the newborn infant. *Current Researches in Anesthesia and Analgesia, 32*, 260–267.

Ash, Caroline; Jasny, Barbara R.; Roberts, Leslie; Stone, Richard & Sugden, Andrew M. (2008). Reimagining cities. *Science, 319*(5864), 739. doi: 10.1126/science.319.5864.739

Ashraf, Quamrul & Galor, Oded. (2013). The 'Out of Africa' hypothesis, human genetic diversity, and comparative economic development. *American Economic Review, 103*(1), 1–46. doi: 10.1257/aer.103.1.1

Ashwin, Sarah & Isupova, Olga. (2014). "Behind every great man...": The male marriage wage premium examined qualitatively. *Journal of Marriage and Family, 76*(1), 37–55. doi: 10.1111/jomf.12082

Aslin, Richard N. (2012). Language development: Revisiting Eimas et al.'s /ba/ and /pa/ study. In Alan M. Slater & Paul C. Quinn (Eds.), *Developmental psychology: Revisiting the classic studies*. Thousand Oaks, CA: Sage.

Asma, Stephen T. (2013). *Against fairness*. Chicago, IL: University of Chicago Press.

Atzil, Shir; Hendler, Talma & Feldman, Ruth. (2014). The brain basis of social synchrony. *Social Cognitive & Affective Neuroscience, 9*(8), 1193–1202. doi: 10.1093/scan/nst105

Aud, Susan; Wilkinson-Flicker, Sidney; Kristapovich, Paul; Rathbun, Amy; Wang, Xiaolei & Zhang, Jijun. (2013). *The condition of education 2013*. Washington, DC: U.S. Department of Education, National Center for Education Statistics.

Aunola, Kaisa; Tolvanen, Asko; Viljaranta, Jaana & Nurmi, Jari-Erik. (2013). Psychological control in daily parent–child interactions increases children's negative emotions. *Journal of Family Psychology, 27*(3), 453–462. doi: 10.1037/a0032891

Aven, Terje. (2011). On some recent definitions and analysis frameworks for risk, vulnerability, and resilience. *Risk Analysis, 31*(4), 515–522. doi 10.1111/j.1539-6924.2010.01528.x

Ayyanathan, Kasirajan (Ed.). (2014). *Specific gene expression and epigenetics: The interplay between the genome and its environment*. Oakville, Canada: Apple Academic Press.

Azrin, Nathan H. & Foxx, Richard M. (1974). *Toilet training in less than a day*. New York, NY: Simon & Schuster.

Babchishin, Lyzon K.; Weegar, Kelly & Romano, Elisa. (2013). Early child care effects on later behavioral outcomes using a Canadian nation-wide sample. *Journal of Educational and Developmental Psychology, 3*(2), 15–29. doi: 10.5539/jedp.v3n2p15

Babineau, Vanessa; Green, Cathryn Gordon; Jolicoeur-Martineau, Alexis; Minde, Klaus; Sassi, Roberto; St-André, Martin, . . . Wazana, Ashley. (2014). Prenatal depression and 5-HTTLPR interact to predict dysregulation from 3 to 36 months - A differential susceptibility model. *Journal of Child Psychology and Psychiatry*. doi: 10.1111/jcpp.12246

Bagwell, Catherine L. & Schmidt, Michelle E. (2011). *Friendships in childhood & adolescence*. New York, NY: Guilford Press.

Baillargeon, Renée. (2000). How do infants learn about the physical world? In Darwin Muir & Alan Slater (Eds.), *Infant development: The essential readings* (pp. 195–212). Malden, MA: Blackwell.

Baillargeon, Renée & DeVos, Julie. (1991). Object permanence in young infants: Further evidence. *Child Development, 62*(6), 1227–1246. doi: 10.1111/j.1467-8624.1991.tb01602.x

Baillargeon, Renée; Stavans, Maayan; Wua, Di; Gertner, Yael; Setoh, Peipei; Kittredge, Audrey K. & Bernard, Amélie. (2012). Object individuation and physical reasoning in infancy: An integrative account. *Language Learning and Development, 8*(1), 4–46. doi: 10.1080/15475441.2012.630610

Baker, Jeffrey P. (2000). Immunization and the American way: 4 childhood vaccines. *American Journal of Public Health, 90*(2), 199–207. doi: 10.2105/AJPH.90.2.199

Baker, J. R. & Hudson, J. L. (2013). Friendship quality and social information processing in clinically anxious children. *Child Psychiatry & Human Development, 45*(1), 12–23. doi: 10.1007/s10578-013-0374-x

Baker, Lindsey A. & Mutchler, Jan E. (2010). Poverty and material hardship in grandparent-headed households. *Journal of Marriage and Family, 72*(4), 947–962. doi: 10.1111/j.1741-3737.2010.00741.x

Baldry, Anna C. & Farrington, David P. (2007). Effectiveness of programs to prevent school bullying. *Victims & Offenders, 2*(2), 183–204. doi: 10.1080/15564880701263155

Baldwin, Dare A. (1993). Infants' ability to consult the speaker for clues to word reference. *Journal of Child Language, 20*(2), 395–418. doi: 10.1017/S0305000900008345

Ball, Helen L. & Volpe, Lane E. (2013). Sudden Infant Death Syndrome (SIDS) risk reduction and infant sleep location – Moving the discussion forward. *Social Science & Medicine, 79*(1), 84–91. doi: 10.1016/j.socscimed.2012.03.025

Bamford, Christi & Lagattuta, Kristin H. (2010). A new look at children's understanding of mind and emotion: The case of prayer. *Developmental Psychology, 46*(1), 78–92. doi: 10.1037/a0016694

Bandura, Albert. (1986). *Social foundations of thought and action: A social cognitive theory*. Englewood Cliffs, NJ: Prentice-Hall.

Bandura, Albert. (1997). The anatomy of stages of change. *American Journal of Health Promotion, 12*(1), 8–10.

Bandura, Albert. (2006). Toward a psychology of human agency. *Perspectives on Psychological Science, 1*(2), 164–180. doi: 10.1111/j.1745-6916.2006.00011.x

Banks, Jane W. (2003). Ka'nisténhsera Teiakotíhsnie's: A native community rekindles the tradition of breastfeeding. *AWHONN Lifelines, 7*(4), 340–347. doi: 10.1177/1091592303257828

Bannon, Michael J.; Johnson, Magen M.; Michelhaugh, Sharon K.; Hartley, Zachary J.; Halter, Steven D.; David, James A., . . . Schmidt, Carl J. (2014). A molecular profile of cocaine abuse includes the differential expression of genes that regulate transcription, chromatin, and dopamine cell phenotype. *Neuropsychopharmacology, 39*(9), 2191–2199. doi: 10.1038/npp.2014.70

Barbaresi, William J.; Colligan, Robert C.; Weaver, Amy L.; Voigt, Robert G.; Killian, Jill M. & Katusic, Slavica K. (2013). Mortality, ADHD, and psychosocial adversity in adults with childhood ADHD: A prospective study. *Pediatrics, 131*(4), 637–644. doi: 10.1542/peds.2012-2354

Barber, Brian K. (Ed.). (2002). *Intrusive parenting: How psychological control affects children and adolescents*. Washington, DC: American Psychological Association.

Barboza, Carolyn F.; Monteiro, Sarojini M. D. R.; Barradas, Susana C.; Sarmiento, Olga L.; Rios, Paola; Ramirez, Andrea, . . . Pratt, Michael. (2013). Physical activity, nutrition and behavior change in Latin America: A systematic review. *Global Health Promotion, 20*(4 Suppl.), 65–81. doi: 10.1177/1757975913502240

Barinaga, Marcia. (2003). Newborn neurons search for meaning. *Science, 299*(5603), 32–34. doi: 10.1126/science.299.5603.32

Barnett, Kylie J.; Finucane, Ciara; Asher, Julian E.; Bargary, Gary; Corvin, Aiden P.; Newell, Fiona N. & Mitchell, Kevin J. (2008). Familial patterns and the origins of individual dif-

ferences in synaesthesia. *Cognition, 106*(2), 871–893. doi: 10.1016/j.cognition.2007.05.003

Barnett, Mark; Watson, Ruth & Kind, Peter. (2006). Pathways to barrel development. In Reha Erzurumlu, et al. (Eds.), *Development and plasticity in sensory thalamus and cortex* (pp. 138–157). New York, NY: Springer. doi: 10.1007/978-0-387-38607-2_9

Barnett, W. Steven; Carolan, Megan E.; Squires, James H. & Brown, Kirsty C. (2013). *The state of preschool, 2013: State preschool yearbook*. New Brunswick, NJ: The National Institute for Early Education Research.

Baron-Cohen, Simon. (2010). Empathizing, systemizing, and the extreme male brain theory of autism. In Ivanka Savic (Ed.), *Progress in brain research: Sex differences in the human brain, their underpinnings and implications* (pp. 167–175). New York, NY: Elsevier. doi: 10.1016/B978-0-444-53630-3.00011-7

Baron-Cohen, Simon; Tager-Flusberg, Helen & Lombardo, Michael (Eds.). (2013). *Understanding other minds: Perspectives from developmental social neuroscience* (3rd ed.). New York, NY: Oxford University Press.

Barr, Rachel. (2013). Memory constraints on infant learning from picture books, television, and touchscreens. *Child Development Perspectives, 7*(4), 205–210. doi: 10.1111/cdep.12041

Barros, Romina M.; Silver, Ellen J. & Stein, Ruth E. K. (2009). School recess and group classroom behavior. *Pediatrics, 123*(2), 431–436. doi: 10.1542/peds.2007-2825

Bartels, Meike; Cacioppo, John T.; van Beijsterveldt, Toos C. E. M. & Boomsma, Dorret I. (2013). Exploring the association between well-being and psychopathology in adolescents. *Behavior Genetics, 43*(3), 177–190. doi: 10.1007/s10519-013-9589-7

Bateson, Patrick & Martin, Paul. (2013). *Play, playfulness, creativity and innovation*. New York, NY: Cambridge University Press.

Bauer, Patricia J.; San Souci, Priscilla & Pathman, Thanujeni. (2010). Infant memory. *Wiley Interdisciplinary Reviews: Cognitive Science, 1*(2), 267–277. doi: 10.1002/wcs.38

Baumard, Nicolas; Mascaro, Olivier & Chevallier, Coralie. (2012). Preschoolers are able to take merit into account when distributing goods. *Developmental Psychology, 48*(2), 492–498. doi: 10.1037/a0026598

Baumrind, Diana. (1967). Child care practices anteceding three patterns of preschool behavior. *Genetic Psychology Monographs, 75*(1), 43–88.

Baumrind, Diana. (1971). Current patterns of parental authority. *Developmental Psychology, 4*(1, Pt. 2), 1–103. doi: 10.1037/h0030372

Baumrind, Diana. (2005). Patterns of parental authority and adolescent autonomy. *New Directions for Child and Adolescent Development, 2005*(108), 61–69. doi: 10.1002/cd.128

Baumrind, Diana; Larzelere, Robert E. & Owens, Elizabeth B. (2010). Effects of preschool parents' power assertive patterns and practices on adolescent development. *Parenting, 10*(3), 157–201. doi: 10.1080/15295190903290790

Bazinger, Claudia & Kühberger, Anton. (2012). Theory use in social predictions. *New Ideas in Psychology, 30*(3), 319–321. doi: 10.1016/j.newideapsych.2012.02.003

Beal, Susan. (1988). Sleeping position and sudden infant death syndrome. *The Medical Journal of Australia, 149*(10), 562

Beauchaine, Theodore P.; Klein, Daniel N.; Crowell, Sheila E.; Derbidge, Christina & Gatzke-Kopp, Lisa. (2009). Multifinality in the development of personality disorders: A Biology × Sex × Environment interaction model of antisocial and borderline traits. *Development and Psychopathology, 21*(3), 735–770. doi: 10.1017/S0954579409000418

Beck, Melinda. (2009, May 26). How's your baby? Recalling the Apgar score's namesake. *The Wall Street Journal*, p. D–1.

Beck, Martha N. (1999). *Expecting Adam: A true story of birth, rebirth, and everyday magic*. New York, NY: Times Books.

Becker, Derek R.; McClelland, Megan M.; Loprinzi, Paul & Trost, Stewart G. (2014). Physical activity, self-regulation, and early academic achievement in preschool children. *Early Education and Development, 25*(1), 56–70. doi: 10.1080/10409289.2013.780505

Begos, Kevin. (2010). A wounded hero. *CR. Collaborations, Results, 5*(1), 30–35, 62–63.

Beilin, Lawrence & Huang, Rae-Chi. (2008). Childhood obesity, hypertension, the metabolic syndrome and adult cardiovascular disease. *Clinical and Experimental Pharmacology and Physiology, 35*(4), 409–411. doi: 10.1111/j.1440-1681.2008.04887.x

Beise, Jan & Voland, Eckart. (2002). A multilevel event history analysis of the effects of grandmothers on child mortality in a historical German population: Krummhörn, Ostfriesland, 1720-1874. *Demographic Research, 7*(13), 469–498. doi: 10.4054/DemRes.2002.7.13

Bell, Martha Ann & Calkins, Susan D. (2011). Attentional control and emotion regulation in early development. In Michael I. Posner (Ed.), *Cognitive neuroscience of attention* (2nd ed., pp. 322–330). New York, NY: Guilford Press.

Belsky, Jay & Pluess, Michael. (2009). The nature (and nurture?) of plasticity in early human development. *Perspectives on Psychological Science, 4*(4), 345–351. doi: 10.1111/j.1745-6924.2009.01136.x

Belsky, Jay & Pluess, Michael. (2012). Differential susceptibility to long-term effects of quality of child care on externalizing behavior in adolescence? *International Journal of Behavioral Development, 36*(1), 2–10. doi: 10.1177/0165025411406855

Benacerraf, Beryl R. (2007). *Ultrasound of fetal syndromes* (2nd ed.). Philadelphia, PA: Churchill Livingstone.

Bender, Heather L.; Allen, Joseph P.; Mcelhaney, Kathleen Boykin; Antonishak, Jill; Moore, Cynthia M.; Kelly, Heather O'beirne & Davis, Steven M. (2007). Use of harsh physical discipline and developmental outcomes in adolescence. *Development and Psychopathology, 19*(1), 227–242. doi: 10.1017/S0954579407070125

Benigno, Joann P.; Byrd, Dana L.; McNamara, Joseph P. H.; Berg, W. Keith & Farrar, M. Jeffrey. (2011). Talking through transitions: Microgenetic changes in preschoolers' private speech and executive functioning. *Child Language Teaching and Therapy, 27*(3), 269–285. doi: 10.1177/0265659010394385

Benjamin, Georges C. (2004). The solution is injury prevention. *American Journal of Public Health, 94*(4), 521. doi: 10.2105/AJPH.94.4.521

Bentley, Gillian R. & Mascie-Taylor, C. G. Nicholas. (2000). Introduction. In Gillian R. Bentley & C. G. Nicholas Mascie-Taylor (Eds.), *Infertility in the modern world: Present and future prospects* (pp. 1–13). New York, NY: Cambridge University Press.

Berenbaum, Sheri A.; Martin, Carol Lynn; Hanish, Laura D.; Briggs, Phillip T. & Fabes, Richard A. (2008). Sex differences in children's play. In Jill B. Becker, et al. (Eds.), *Sex differences in the brain: From genes to behavior* (pp. 275–290). New York, NY: Oxford University Press.

Berg, Sandra J. & Wynne-Edwards, Katherine E. (2002). Salivary hormone concentrations in mothers and fathers becoming parents are not correlated. *Hormones & Behavior, 42*(4), 424–436. doi: 10.1006/hbeh.2002.1841

Berger, Kathleen S. (1980). *The developing person* (1st ed.). New York, NY: Worth.

Berger, Kathleen S. (2007). Update on bullying at school: Science forgotten? *Developmental Review, 27*(1), 90–126. doi: 10.1016/j.dr.2006.08.002

Berger, Lawrence M.; Paxson, Christina & Waldfogel, Jane. (2009). Income and child development. *Children and Youth Services Review, 31*(9), 978–989. doi: 10.1016/j.childyouth.2009.04.013

Bernard, Kristin & Dozier, Mary. (2010). Examining infants' cortisol responses to laboratory tasks among children varying in attachment disorganization: Stress reactivity or return to baseline? *Developmental Psychology, 46*(6), 1771–1778. doi: 10.1037/a0020660

Bernard, Kristin; Lind, Teresa & Dozier, Mary. (2014). Neurobiological consequences of neglect and abuse. In Jill E. Korbin & Richard D. Krugman (Eds.), *Handbook of child maltreatment* (pp. 205–223). New York, NY: Springer. doi: 10.1007/978-94-007-7208-3_11

Bers, Marina; Seddighin, Safoura & Sullivan, Amanda. (2013). Ready for robotics: Bringing together the T and E of STEM in early childhood teacher education. *Journal of Technology and Teacher Education, 21*(3), 355–377.

Betancourt, Theresa S.; McBain, Ryan; Newnham, Elizabeth A. & Brennan, Robert T. (2013). Trajectories of internalizing problems in war-affected Sierra Leonean

youth: Examining conflict and postconflict factors. *Child Development*, *84*(2), 455–470. doi: 10.1111/j.1467-8624.2012.01861.x

Bhatia, Tej K. & Ritchie, William C. (Eds.). (2013). *The handbook of bilingualism and multilingualism* (2nd ed.). Malden, MA: Wiley-Blackwell.

Bhatnagar, Aruni; Whitsel, Laurie P.; Ribisl, Kurt M.; Bullen, Chris; Chaloupka, Frank; Piano, Mariann R., . . . Benowitz, Neal. (2014). Electronic cigarettes: A policy statement from the American Heart Association. *Circulation*, *130*(16), 1418–1436. doi: 10.1161/CIR.0000000000000107

Bhutta, Zulfiqar A.; Ali, Samana; Cousens, Simon; Ali, Talaha M.; Haider, Batool A.; Rizvi, Arjumand, . . . Black, Robert E. (2008). Interventions to address maternal, newborn, and child survival: What difference can integrated primary health care strategies make? *The Lancet*, *372*(9642), 972–989. doi: 10.1016/S0140-6736(08)61407-5

Bialystok, Ellen. (2010). Global-local and trail-making tasks by monolingual and bilingual children: Beyond inhibition. *Developmental Psychology*, *46*(1), 93–105. doi: 10.1037/a0015466

Bianconi, Eva; Piovesan, Allison; Facchin, Federica; Beraudi, Alina; Casadei, Raffaella; Frabetti, Flavia, . . . Canaider, Silvia. (2013). An estimation of the number of cells in the human body. *Annals of Human Biology*, *40*(6), 463–471. doi: 10.3109/03014460.2013.807878

Bienvenu, Thierry. (2005). Rett syndrome. In Merlin G. Butler & F. John Meaney (Eds.), *Genetics of developmental disabilities* (pp. 477–519). Boca Raton, FL: Taylor & Francis.

Bigler, Rebecca S. & Wright, Yamanda F. (2014). Reading, writing, arithmetic, and racism? Risks and benefits to teaching children about intergroup biases. *Child Development Perspectives*, *8*(1), 18–23. doi: 10.1111/cdep.12057

Birdsong, David. (2006). Age and second language acquisition and processing: A selective overview. *Language Learning*, *56*(Suppl. 1), 9–49. doi: 10.1111/j.1467-9922.2006.00353.x

Bisiacchi, Patrizia Silvia; Mento, Giovanni & Suppiej, Agnese. (2009). Cortical auditory processing in preterm newborns: An ERP study. *Biological Psychology*, *82*(2), 176–185. doi: 10.1016/j.biopsycho.2009.07.005

Bjorklund, David F.; Dukes, Charles & Brown, Rhonda D. (2009). The development of memory strategies. In Mary L. Courage & Nelson Cowan (Eds.), *The development of memory in infancy and childhood* (2nd ed., pp. 145–175). New York, NY: Psychology Press.

Bjorklund, David F. & Sellers, Patrick D. (2014). Memory development in evolutionary perspective. In Patricia Bauer & Robyn Fivush (Eds.), *The Wiley handbook on the development of children's memory* (Vol. 1, pp. 126–150). Malden, MA: Wiley.

Blad, Evie. (2014). Some states overhauling vaccine laws. *Education Week*, *33*(31).

Blair, Clancy & Dennis, Tracy. (2010). An optimal balance: The integration of emotion and cognition in context. In Susan D. Calkins & Martha Ann Bell (Eds.), *Child development at the intersection of emotion and cognition* (pp. 17–36). Washington, DC: American Psychological Association.

Blair, Clancy & Raver, C. Cybele. (2012). Child development in the context of adversity: Experiential canalization of brain and behavior. *American Psychologist*, *67*(4), 309–318. doi: 10.1037/a0027493

Blandon, Alysia Y.; Calkins, Susan D. & Keane, Susan P. (2010). Predicting emotional and social competence during early childhood from toddler risk and maternal behavior. *Development and Psychopathology*, *22*(1), 119–132. doi: 10.1017/S0954579409990307

Bliss, Catherine. (2012). *Race decoded: The genomic fight for social justice*. Stanford, CA: Stanford University Press.

Blum, Deborah. (2002). *Love at Goon Park. Harry Harlow and the science of affection*. Cambridge, MA: Perseus.

Blurton-Jones, Nicholas G. (1976). Rough-and-tumble play among nursery school children. In Jerome S. Bruner, et al. (Eds.), *Play: Its role in development and evolution* (pp. 352–363). New York, NY: Basic Books.

Bögels, Susan M.; Knappe, Susanne & Clark, Lee Anna. (2013). Adult separation anxiety disorder in DSM-5. *Clinical Psychology Review*, *33*(5), 663–674. doi: 10.1016/j.cpr.2013.03.006

Bombard, Jennifer M.; Robbins, Cheryl L.; Dietz, Patricia M. & Valderrama, Amy L. (2013). Preconception care: The perfect opportunity for health care providers to advise lifestyle changes for hypertensive women. *American Journal of Health Promotion*, *27*(3), S43–S49. doi: 10.4278/ajhp.120109-QUAN-6

Booth, Alan & Dunn, Judy (Eds.). (2014). *Stepfamilies: Who benefits? Who does not?* New York, NY: Routledge.

Borke, Jörn; Lamm, Bettina; Eickhorst, Andreas & Keller, Heidi. (2007). Father-infant interaction, paternal ideas about early child care, and their consequences for the development of children's self-recognition. *Journal of Genetic Psychology*, *168*(4), 365–379. doi: 10.3200/GNTP.168.4.365-380

Bornstein, Marc H. (2014). Human infancy and the rest of the lifespan. *Annual Review of Psychology*, *65*, 121–158. doi: 10.1146/annurev-psych-120710-100359

Bornstein, Marc H.; Arterberry, Martha E. & Mash, Clay. (2005). Perceptual development. In Marc H. Bornstein & Michael E. Lamb (Eds.), *Developmental science: An advanced textbook* (5th ed., pp. 283–325). Mahwah, NJ: Lawrence Erlbaum Associates.

Bornstein, Marc H. & Colombo, John. (2012). Infant cognitive functioning and mental development. In Sabina Pauen (Ed.), *Early childhood development and later outcome*. New York, NY: Cambridge University Press.

Bornstein, Marc H.; Hahn, Chun-Shin & Wolke, Dieter. (2013). System and cascades in cognitive development and academic achievement. *Child Development*, *84*(1), 154–162. doi: 10.1111/j.1467-8624.2012.01849.x

Bornstein, Marc H.; Mortimer, Jeylan T.; Lutfey, Karen & Bradley, Robert. (2011). Theories and processes in life-span socialization. In Karen L. Fingerman, et al. (Eds.), *Handbook of life-span development* (pp. 27–56). New York, NY: Springer.

Borrelli, Belinda; McQuaid, Elizabeth L.; Novak, Scott P.; Hammond, S. Katharine & Becker, Bruce. (2010). Motivating Latino caregivers of children with asthma to quit smoking: A randomized trial. *Journal of Consulting and Clinical Psychology*, *78*(1), 34–43. doi: 10.1037/a0016932

Boseovski, Janet J. (2010). Evidence for "rose-colored glasses": An examination of the positivity bias in young children's personality judgments. *Child Development Perspectives*, *4*(3), 212–218. doi: 10.1111/j.1750-8606.2010.00149.x

Bower, Bruce. (2007). Net heads: Huge numbers of brain cells may navigate small worlds. *Science News*, *171*(7), 104–106. doi: 10.1002/scin.2007.5591710709

Bowes, Lucy; Maughan, Barbara; Caspi, Avshalom; Moffitt, Terrie E. & Arseneault, Louise. (2010). Families promote emotional and behavioural resilience to bullying: Evidence of an environmental effect. *Journal of Child Psychology and Psychiatry*, *51*(7), 809–817. doi: 10.1111/j.1469-7610.2010.02216.x

Boyd, Wendy; Walker, Susan & Thorpe, Karen. (2013). Choosing Work and Care: Four Australian women negotiating return to paid work in the first year of motherhood. *Contemporary Issues in Early Childhood*, *14*(2), 168–178. doi: 10.2304/ciec.2013.14.2.168

Bracken, Bruce A. & Crawford, Elizabeth. (2010). Basic concepts in early childhood educational standards: A 50-state review. *Early Childhood Education Journal*, *37*(5), 421–430. doi: 10.1007/s10643-009-0363-7

Bradley, Rachel & Slade, Pauline. (2011). A review of mental health problems in fathers following the birth of a child. *Journal of Reproductive and Infant Psychology*, *29*(1), 19–42. doi: 10.1080/02646838.2010.513047

Brainerd, Charles J.; Reyna, Valerie F. & Ceci, Stephen J. (2008). Developmental reversals in false memory: A review of data and theory. *Psychological Bulletin*, *134*(3), 343–382. doi: 10.1037/0033-2909.134.3.343

Brakefield, Tiffany A.; Mednick, Sara C.; Wilson, Helen W.; De Neve, Jan-Emmanuel; Christakis, Nicholas A. & Fowler, James H. (2014). Same-sex sexual attraction does not spread in adolescent social networks. *Archives of Sexual Behavior*, *43*(2), 335–344. doi: 10.1007/s10508-013-0142-9

Brandone, Amanda C.; Horwitz, Suzanne R.; Aslin, Richard N. & Wellman, Henry M. (2014). Infants' goal anticipation during failed and successful reaching actions. *Developmental Science*, *17*(1), 23–34. doi: 10.1111/desc.12095

Brazelton, T. Berry & Sparrow, Joshua D. (2006). *Touchpoints, birth to 3: Your child's emotional and behavioral development* (2nd ed.). Cambridge, MA: Da Capo Press.

Bremner, J. Gavin & Wachs, Theodore D. (Eds.). (2010). *The Wiley-Blackwell handbook of infant development* (2nd ed.). Malden, MA: Wiley-Blackwell.

Brendgen, Mara; Lamarche, Véronique; Wanner, Brigitte & Vitaro, Frank. (2010). Links between friendship relations and early adolescents' trajectories of depressed mood. *Developmental Psychology, 46*(2), 491–501. doi: 10.1037/a0017413

Brennan, Arthur; Ayers, Susan; Ahmed, Hafez & Marshall-Lucette, Sylvie. (2007). A critical review of the Couvade syndrome: The pregnant male. *Journal of Reproductive and Infant Psychology, 25*(3), 173–189. doi: 10.1080/02646830701467207

Bretherton, Inge. (2010). Fathers in attachment theory and research: A review. *Early Child Development and Care, 180*(1/2), 9–23. doi: 10.1080/03004430903414661

Brickhouse, Tegwyn H.; Rozier, R. Gary & Slade, Gary D. (2008). Effects of enrollment in Medicaid versus the State Children's Health Insurance Program on kindergarten children's untreated dental caries. *American Journal of Public Health, 98*(5), 876–881. doi: 10.2105/ajph.2007.111468

Brody, Jane E. (2012, July 24). The ideal and the real of breast-feeding. *The New York Times*.

Brody, Jane E. (2013, February 26). Too many pills in pregnancy. *The New York Times*, p. D5.

Bronfenbrenner, Urie. (1977). Toward an experimental ecology of human development. *American Psychologist, 32*(7), 513–531. doi: 10.1037//0003-066X.32.7.513

Bronfenbrenner, Urie. (1986). Recent advances in research on the ecology of human development. In Rainer Silbereisen, et al. (Eds.), *Development as action in context problem behavior and normal youth development* (pp. 287–309). New York, NY: Springer.

Bronfenbrenner, Urie & Morris, Pamela A. (2006). The bioecological model of human development. In William Damon & Richard M. Lerner (Eds.), *Handbook of child psychology* (6th ed., Vol. 1, pp. 793–828). Hoboken, NJ: Wiley.

Brooker, Robert J. (2009). *Genetics: Analysis & principles* (3rd ed.). New York, NY: McGraw-Hill.

Brooker, Rebecca J.; Buss, Kristin A.; Lemery-Chalfant, Kathryn; Aksan, Nazan; Davidson, Richard J. & Goldsmith, H. Hill. (2013). The development of stranger fear in infancy and toddlerhood: Normative development, individual differences, antecedents, and outcomes. *Developmental Science, 16*(6), 864–878. doi: 10.1111/desc.12058

Brouwer, Rachel M.; van Soelen, Inge L. C.; Swagerman, Suzanne C.; Schnack, Hugo G.; Ehli, Erik A.; Kahn, René S., . . . Boomsma, Dorret I. (2014). Genetic associations between intelligence and cortical thickness emerge at the start of puberty. *Human Brain Mapping, 35*(8), 3760–3773. doi: 10.1002/hbm.22435

Brown, Christia Spears; Alabi, Basirat O.; Huynh, Virginia W. & Masten, Carrie L. (2011). Ethnicity and gender in late childhood and early adolescence: Group identity and awareness of bias. *Developmental Psychology, 47*(2), 463–471. doi: 10.1037/a0021819

Brown, Susan L. (2010). Marriage and child well-being: Research and policy perspectives. *Journal of Marriage and Family, 72*(5), 1059–1077. doi: 10.1111/j.1741-3737.2010.00750.x

Brownell, Celia A.; Svetlova, Margarita; Anderson, Ranita; Nichols, Sara R. & Drummond, Jesse. (2013). Socialization of early prosocial behavior: Parents' talk about emotions is associated with sharing and helping in toddlers. *Infancy, 18*(1), 91–119. doi: 10.1111/j.1532-7078.2012.00125.x

Bruck, Maggie; Ceci, Stephen J. & Principe, Gabrielle F. (2006). The child and the law. In William Damon & Richard M. Lerner (Eds.), *Handbook of child psychology* (6th ed., Vol. 4, pp. 776–816). Hoboken, NJ: Wiley.

Bryant, Gregory A. & Barrett, H. Clark. (2007). Recognizing intentions in infant-directed speech: Evidence for universals. *Psychological Science, 18*(8), 746–751. doi: 10.1111/j.1467-9280.2007.01970.x

Buhrmester, Michael D.; Blanton, Hart & Swann, William B. (2011). Implicit self-esteem: Nature, measurement, and a new way forward. *Journal of Personality and Social Psychology, 100*(2), 365–385. doi: 10.1037/a0021341

Bulpitt, Christopher J.; Beckett, Nigel; Peters, Ruth; Staessen, Jan A.; Wang, Ji-Guang; Comsa, Marius, . . . Rajkumar, Chakravarthi. (2013). Does white coat hypertension require treatment over age 80? Results of the hypertension in the very elderly trial ambulatory blood pressure side project. *Hypertension, 61*(1), 89–94. doi: 10.1161/HYPERTENSIONAHA.112.191791

Burt, S. Alexandra. (2009). Rethinking environmental contributions to child and adolescent psychopathology: A meta-analysis of shared environmental influences. *Psychological Bulletin, 135*(4), 608–637. doi: 10.1037/a0015702

Buss, David M.; Shackelford, Todd K.; Kirkpatrick, Lee A. & Larsen, Randy J. (2001). A half century of mate preferences: The cultural evolution of values. *Journal of Marriage and Family, 63*(2), 491–503. doi: 10.1111/j.1741-3737.2001.00491.x

Butler, Merlin G. & Meaney, F. John (Eds.) (2005). *Genetics of developmental disabilities*. Boca Raton, FL: Taylor & Francis.

Buttelmann, David; Zmyj, Norbert; Daum, Moritz & Carpenter, Malinda. (2013). Selective imitation of in-group over out-group members in 14-month-old infants. *Child Development, 84*(2), 22–428. doi: 10.1111/j.1467-8624.2012.01860.x

Butterworth, Brian & Kovas, Yulia. (2013). Understanding neurocognitive developmental disorders can improve education for all. *Science, 340*(6130), 300–305. doi: 10.1126/science.1231022

Butterworth, Brian; Varma, Sashank & Laurillard, Diana. (2011). Dyscalculia: From brain to education. *Science, 332*(6033), 1049–1053. doi: 10.1126/science.1201536

Byard, Roger W. (2014). "Shaken baby syndrome" and forensic pathology: An uneasy interface. *Forensic Science, Medicine, and Pathology, 10*(2), 239–241. doi: 10.1007/s12024-013-9514-7

Byers-Heinlein, Krista; Burns, Tracey C. & Werker, Janet F. (2010). The roots of bilingualism in newborns. *Psychological Science, 21*(3), 343–348. doi: 10.1177/0956797609360758

Calarco, Jessica McCrory. (2014). The inconsistent curriculum: Cultural tool kits and student interpretations of ambiguous expectations. *Social Psychology Quarterly, 77*(2), 185–209. doi: 10.1177/0190272514521438

Calkins, Susan D. & Keane, Susan P. (2009). Developmental origins of early antisocial behavior. *Development and Psychopathology, 21*(4), 1095–1109. doi: 10.1017/S0954579409990006X

Callaghan, Tara. (2013). Symbols and symbolic thought. In Philip D. Zelazo (Ed.), *The Oxford handbook of developmental psychology* (Vol. 1). New York, NY: Oxford University Press. doi: 10.1093/oxfordhb/9780199958450.013.0034

Calvert, Karin. (2003). Patterns of childrearing in America. In Willem Koops & Michael Zuckerman (Eds.), *Beyond the century of the child: Cultural history and developmental psychology* (pp. 62–81). Philadelphia, PA: University of Pennsylvania Press.

Cameron, Judy & Pierce, W. David. (2002). *Rewards and intrinsic motivation: Resolving the controversy*. Westport, CT: Bergin & Garvey.

Camos, Valérie & Barrouillet, Pierre. (2011). Developmental change in working memory strategies: From passive maintenance to active refreshing. *Developmental Psychology, 47*(3), 898–904. doi: 10.1037/a0023193

Campbell, Frances; Conti, Gabriella; Heckman, James J.; Moon, Seong H.; Pinto, Rodrigo; Pungello, Elizabeth & Pan, Yi. (2014). Early childhood investments substantially boost adult health. *Science, 343*(6178), 1478–1485. doi: 10.1126/science.1248429

Campbell, Frances A.; Pungello, Elizabeth P.; Miller-Johnson, Shari; Burchinal, Margaret & Ramey, Craig T. (2001). The development of cognitive and academic abilities: Growth curves from an early childhood educational experiment. *Developmental Psychology, 37*(2), 231–242. doi: 10.1037/0012-1649.37.2.231

Camras, Linda A. & Shutter, Jennifer M. (2010). Emotional facial expressions in infancy. *Emotion Review, 2*(2), 120–129. doi: 10.1177/1754073909352529

Canadian Paediatric Society. (2008). Adolescent sexual orientation. *Paediatrics & Child Health, 13*(7), 619–623.

Canagarajah, A. Suresh & Wurr, Adrian J. (2011). Multilingual communication and language acquisition: New research directions. *The Reading Matrix, 11*(1), 1–15.

Caravita, Simona C. S. & Cillessen, Antonius H. N. (2012). Agentic or communal? Associations between interpersonal goals, popularity, and bullying in middle childhood and early adolescence. *Social Development, 21*(2), 376–395. doi: 10.1111/j.1467-9507.2011.00632.x

Caravita, Simona C. S.; Di Blasio, Paola & Salmivalli, Christina. (2010). Early adolescents' participation in bullying: Is ToM involved? *The Journal of Early Adolescence, 30*(1), 138–170. doi: 10.1177/0272431609342983

Cardoso-Leite, Pedro & Bavelier, Daphne. (2014). Video game play, attention, and learning: How to shape the development of attention and influence learning? *Current Opinion in Neurology, 27*(2), 185–191. doi: 10.1097/WCO.0000000000000077

Carey, Susan. (2009). *The origin of concepts*. New York, NY: Oxford University Press.

Carey, Susan. (2010). Beyond fast mapping. *Language Learning and Development, 6*(3), 184–205. doi: 10.1080/15475441.2010.484379

Carlson, Susan A.; Fulton, Janet E.; Lee, Sarah M.; Maynard, L. Michele; Brown, David R.; Kohl, Harold W. & Dietz, William H. (2008). Physical education and academic achievement in elementary school: Data from the early childhood longitudinal study. *American Journal of Public Health, 98*(4), 721–727. doi: 10.2105/ajph.2006.101576

Carlson, Stephanie M.; Koenig, Melissa A. & Harms, Madeline B. (2013). Theory of mind. *Wiley Interdisciplinary Reviews: Cognitive Science 4*(4), 391–402. doi: 10.1002/wcs.1232

Carpenter, Siri. (2012). Psychology's bold initiative. *Science, 335*(6076), 1558–1561. doi: 10.1126/science.335.6076.1558

Carson, Valerie; Tremblay, Mark S.; Spence, John C.; Timmons, Brian W. & Janssen, Ian. (2013). The Canadian Sedentary Behaviour Guidelines for the Early Years (zero to four years of age) and screen time among children from Kingston, Ontario. *Paediatrics & Child Health, 18*(1), 25–28.

Caruso, Federica. (2013). Embedding early childhood education and care in the socio-cultural context: The case of Italy. In Jan Georgeson & Jane Payler (Eds.), *International perspectives on early childhood education and care*. New York, NY: Open University Press.

Case-Smith, Jane & Kuhaneck, Heather Miller. (2008). Play preferences of typically developing children and children with developmental delays between ages 3 and 7 years. *OTJR Occupation, Participation and Health, 28*(1), 19–29. doi: 10.3928/15394492-20080101-01

Caspi, Avshalom; Moffitt, Terrie E.; Morgan, Julia; Rutter, Michael; Taylor, Alan; Arseneault, Louise, . . . Polo-Tomas, Monica. (2004). Maternal expressed emotion predicts children's antisocial behavior problems: Using monozygotic-twin differences to identify environmental effects on behavioral development. *Developmental Psychology, 40*(2), 149–161. doi: 10.1037/0012-1649.40.2.149

Cassia, Viola Macchi; Kuefner, Dana; Picozzi, Marta & Vescovo, Elena. (2009). Early experience predicts later plasticity for face processing: Evidence for the reactivation of dormant effects. *Psychological Science, 20*(7), 853–859. doi: 10.1111/j.1467-9280.2009.02376.x

Catani, Claudia; Gewirtz, Abigail H.; Wieling, Elizabeth; Schauer, Elizabeth; Elbert, Thomas & Neuner, Frank. (2010). Tsunami, war, and cumulative risk in the lives of Sri Lankan schoolchildren. *Child Development, 81*(4), 1176–1191. doi: 10.1111/j.1467-8624.2010.01461.x

Cavalari, Rachel N. S. & Donovick, Peter J. (2014). Agenesis of the corpus callosum: Symptoms consistent with developmental disability in two siblings. *Neurocase: The Neural Basis of Cognition*. doi: 10.1080/13554794.2013.873059

Ceballo, Rosario; Maurizi, Laura K.; Suarez, Gloria A. & Aretakis, Maria T. (2014). Gift and sacrifice: Parental involvement in Latino adolescents' education. *Cultural Diversity and Ethnic Minority Psychology, 20*(1), 116–127. doi: 10.1037/a0033472

Ceci, Stephen J. & Bruck, Maggie. (1995). *Jeopardy in the courtroom: A scientific analysis of children's testimony*. Washington, DC: American Psychological Association.

Cecil, Kim M.; Brubaker, Christopher J.; Adler, Caleb M.; Dietrich, Kim N.; Altaye, Mekibib; Egelhoff, John C., . . . Lanphear, Bruce P. (2008). Decreased brain volume in adults with childhood lead exposure. *PloS Medicine, 5*(5), 741–750. doi: 10.1371/journal.pmed.0050112

Centers for Disease Control and Prevention. (2012, August). *Breastfeeding report card — United States, 2012*. Atlanta, GA: National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention.

Centers for Disease Control and Prevention. (2012, May). *Epidemiology and prevention of vaccine-preventable diseases* (William Atkinson, et al. Eds. Revised 12th ed.). Washington DC: Public Health Foundation.

Centers for Disease Control and Prevention. (2013, July). *Breastfeeding report card—United States, 2013*. Atlanta, GA: National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention.

Centers for Disease Control and Prevention. (2014). *Breastfeeding among U.S. children born 2001–2011, CDC National Immunization Survey*. Atlanta, GA: National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention.

Centers for Disease Control and Prevention. (2014). Underlying cause of death 1999–2012. Retrieved January 21, 2015, from CDC WONDER Online Database http://wonder.cdc.gov/ucd-icd10.html

Centers for Disease Control and Prevention. (2014, January). *2014 Recommended immunizations for children from birth through 6 years old*. Atlanta, GA: U.S. Department of Health and Human Services, Centers For Disease Control and Prevention.

Centers for Disease Control and Prevention. (2014, October 17). *Updates on CDC's Polio eradication efforts*. Atlanta, GA: Centers for Disease Control and Prevention.

Centre for Community Child Health & Telethon Institute for Child Health Research. (2009). *A snapshot of early childhood development in Australia: Australian Early Development Index (AEDI) national report 2009*. Canberra, Australia: Australian Government Department of Education.

Cespedes, Elizabeth M.; McDonald, Julia; Haines, Jess; Bottino, Clement J.; Schmidt, Marie Evans & Taveras, Elsie M. (2013). Obesity related behaviors of US- and non-US-born parents and children in low-income households. *Journal of Developmental & Behavioral Pediatrics, 34*(8), 541–548. doi: 10.1097/DBP.0b013e3182a509fb

Chafen, Jennifer J. S.; Newberry, Sydne J.; Riedl, Marc A.; Bravata, Dena M.; Maglione, Margaret; Suttorp, Marika J., . . . Shekelle, Paul G. (2010). Diagnosing and managing common food allergies. *JAMA, 303*(18), 1848–1856. doi: 10.1001/jama.2010.582

Chambers, John R.; Swan, Lawton K. & Heesacker, Martin. (2014). Better off than we know: Distorted perceptions of incomes and income inequality in America. *Psychological Science, 25*(2), 613–618. doi: 10.1177/0956797613504965

Champagne, Frances A. & Curley, James P. (2010). Maternal care as a modulating influence on infant development. In Mark S. Blumberg, et al. (Eds.), *Oxford handbook of developmental behavioral neuroscience* (pp. 323–341). New York, NY: Oxford University Press. doi: 10.1093/oxfordhb/9780195314731.013.0017

Chan, Cheri C. Y.; Tardif, Twila; Chen, Jie; Pulverman, Rachel B.; Zhu, Liqi & Meng, Xiangzhi. (2011). English- and Chinese-learning infants map novel labels to objects and actions differently. *Developmental Psychology, 47*(5), 1459–1471. doi: 10.1037/a0024049

Chan, David W. & Zhao, Yongjun. (2010). The relationship between drawing skill and artistic creativity: Do age and artistic involvement make a difference? *Creativity Research Journal, 22*(1), 27–36. doi: 10.1080/10400410903579528

Chan, Tak Wing & Koo, Anita. (2011). Parenting style and youth outcomes in the UK. *European Sociological Review, 27*(3), 385–399. doi: 10.1093/esr/jcq013

Chaplin, Lan Nguyen & John, Deborah Roedder. (2007). Growing up in a material world: Age differences in materialism in children and adolescents. *Journal of Consumer Research, 34*(4), 480–493. doi: 10.1086/518546

Chartier, Karen G.; Scott, Denise M.; Wall, Tamara L.; Covault, Jonathan; Karriker-Jaffe, Katherine J.; Mills, Britain A., . . . Arroyo, Judith A. (2014). Framing ethnic variations in alcohol outcomes from biological pathways to neighborhood context. *Alcoholism: Clinical and Experimental Research*, *38*(3), 611–618. doi: 10.1111/acer.12304

Chen, Edith; Cohen, Sheldon & Miller, Gregory E. (2010). How low socioeconomic status affects 2-year hormonal trajectories in children. *Psychological Science*, *21*(1), 31–37. doi: 10.1177/0956797609355566

Chen, Gong & Gao, Yuan. (2013). Changes in social participation of older adults in Beijing. *Ageing International*, *38*(1), 15–27. doi: 10.1007/s12126-012-9167-y

Chen, Xinyin. (2011). Culture and children's socioemotional functioning: A contextual-developmental perspective. In Xinyin Chen & Kenneth H. Rubin (Eds.), *Socioemotional development in cultural context* (pp. 29–52). New York, NY: Guilford Press.

Chen, Xinyin; Cen, Guozhen; Li, Dan & He, Yunfeng. (2005). Social functioning and adjustment in Chinese children: The imprint of historical time. *Child Development*, *76*(1), 182–195. doi: 10.1111/j.1467-8624.2005.00838.x

Chen, Xinyin; Rubin, Kenneth H. & Sun, Yuerong. (1992). Social reputation and peer relationships in Chinese and Canadian children: A cross-cultural study. *Child Development*, *63*(6), 1336–1343. doi: 10.1111/j.1467-8624.1992.tb01698.x

Chen, Xinyin; Wang, Li & Wang, Zhengyan. (2009). Shyness-sensitivity and social, school, and psychological adjustment in rural migrant and urban children in China. *Child Development*, *80*(5), 1499–1513. doi: 10.1111/j.1467-8624.2009.01347.x

Chen, Xinyin; Yang, Fan & Wang, Li. (2013). Relations between shyness-sensitivity and internalizing problems in Chinese children: Moderating effects of academic achievement. *Journal of Abnormal Child Psychology*, *41*(5), 825–836. doi: 10.1007/s10802-012-9708-6

Chen, Yi; Li, Guanghui; Ruan, Yan; Zou, Liying; Wang, Xin & Zhang, Weiyuan. (2013). An epidemiological survey on low birth weight infants in China and analysis of outcomes of full-term low birth weight infants. *BMC Pregnancy and Childbirth*, *13*, 242. doi: 10.1186/1471-2393-13-242

Cheng, Diana; Kettinger, Laurie; Uduhiri, Kelechi & Hurt, Lee. (2011). Alcohol consumption during pregnancy: Prevalence and provider assessment. *Obstetrics & Gynecology*, *117*(2), 212–217. doi: 10.1097/AOG.0b013e3182078569

Cheng, Yvonne W.; Shaffer, Brian; Nicholson, James & Caughey, Aaron B. (2014). Second stage of labor and epidural use: A larger effect than previously suggested. *Obstetrics & Gynecology*, *123*(3), 527–535. doi: 10.1097/AOG.0000000000000134

Cherlin, Andrew J. (2009). *The marriage-go-round: The state of marriage and the family in America today*. New York, NY: Knopf.

Chesłack-Postava, Keely; Liu, Kayuet & Bearman, Peter S. (2011). Closely spaced pregnancies are associated with increased odds of autism in California sibling births. *Pediatrics*, *127*(2), 246–253. doi: 10.1542/peds.2010-2371

Choe, Daniel E.; Lane, Jonathan D.; Grabell, Adam S. & Olson, Sheryl L. (2013a). Developmental precursors of young school-age children's hostile attribution bias. *Developmental Psychology*, *49*(12), 2245–2256. doi: 10.1037/a0032293

Choe, Daniel E.; Olson, Sheryl L. & Sameroff, Arnold J. (2013b). The interplay of externalizing problems and physical and inductive discipline during childhood. *Developmental Psychology*, *49*(11), 2029–2039. doi: 10.1037/a0032054

Chomsky, Noam. (1968). *Language and mind*. New York, NY: Harcourt Brace & World.

Chomsky, Noam. (1980). *Rules and representations*. New York, NY: Columbia University Press.

Christian, Cindy W. & Block, Robert. (2009). Abusive head trauma in infants and children. *Pediatrics*, *123*(5), 1409–1411. doi: 10.1542/peds.2009-0408

Christiansen, Sofie; Axelstad, Marta; Boberg, Julie; Vinggaard, Anne M.; Pedersen, Gitte A. & Hass, Ulla. (2014). Low-dose effects of bisphenol A on early sexual development in male and female rats. *Reproduction*, *147*(4), 477–487 doi: 10.1530/REP-13-0377

Chudacoff, Howard P. (2011). The history of children's play in the United States. In Anthony D. Pellegrini (Ed.), *The Oxford handbook of the development of play* (pp. 101–109). New York, NY: Oxford University Press. doi: 10.1093/oxfordhb/9780195393002.013.0009

Cicchetti, Dante. (2013a). Annual Research Review: Resilient functioning in maltreated children – past, present, and future perspectives. *Journal of Child Psychology and Psychiatry*, *54*(4), 402–422. doi: 10.1111/j.1469-7610.2012.02608.x

Cicchetti, Dante. (2013b). An overview of developmental psychopathology. In Philip D. Zelazo (Ed.), *The Oxford handbook of developmental psychology* (Vol. 2, pp. 455–480). New York, NY: Oxford University Press. doi: 10.1093/oxfordhb/9780199958474.013.0018

Cicconi, Megan. (2014). Vygotsky meets technology: A reinvention of collaboration in the early childhood mathematics classroom. *Early Childhood Education Journal*, *42*(1), 57–65. doi: 10.1007/s10643-013-0582-9

Cillessen, Antonius H. N. & Marks, Peter E. L. (2011). Conceptualizing and measuring popularity. In Antonius H. N. Cillessen, et al. (Eds.), *Popularity in the peer system* (pp. 25–56). New York, NY: Guilford Press.

Cimpian, Andrei. (2013). Generic statements, causal attributions, and children's naive theories. In Mahzarin R. Banaji & Susan A. Gelman (Eds.), *Navigating the social world: What infants, children, and other species can teach us* (pp. 269–274). New York, NY: Oxford University Press.

Clark, Caron A. C.; Fang, Hua; Espy, Kimberly A.; Filipek, Pauline A.; Juranek, Jenifer; Bangert, Barbara, . . . Taylor, H. Gerry. (2013). Relation of neural structure to persistently low academic achievement: A longitudinal study of children with differing birth weights. *Neuropsychology*, *27*(3), 364–377. doi: 10.1037/a0032273

Clark, Nina A.; Demers, Paul A.; Karr, Catherine J.; Koehoorn, Mieke; Lencar, Cornel; Tamburic, Lillian & Brauer, Michael. (2010). Effect of early life exposure to air pollution on development of childhood asthma. *Environmental Health Perspectives*, *118*(2), 284–290. doi: 10.1289/ehp.0900916

Cohen, David. (2006). *The development of play* (3rd ed.). New York, NY: Routledge.

Cohen, Jon. (2007). Hope on new AIDS drugs, but breast-feeding strategy backfires. *Science*, *315*(5817), 1357. doi: 10.1126/science.315.5817.1357

Cohen, Joel E. & Malin, Martin B. (Eds.). (2010). *International perspectives on the goals of universal basic and secondary education*. New York, NY: Routledge.

Cohen, Larry; Chávez, Vivian & Chehimi, Sana (Eds.). (2010). *Prevention is primary: Strategies for community well-being* (2nd ed.). San Francisco, CA: Jossey-Bass.

Cohen, Leslie B. & Cashon, Cara H. (2006). Infant cognition. In William Damon & Richard M. Lerner (Eds.), *Handbook of child psychology* (6th ed., Vol. 2, pp. 214–251). Hoboken, NJ: Wiley.

Colaco, Marc; Johnson, Kelly; Schneider, Dona & Barone, Joseph. (2013). Toilet training method is not related to dysfunctional voiding. *Clinical Pediatrics*, *52*(1), 49–53. doi: 10.1177/0009922812464042

Cole, Pamela M.; Tan, Patricia Z.; Hall, Sarah E.; Zhang, Yiyun; Crnic, Keith A.; Blair, Clancy B. & Li, Runze. (2011). Developmental changes in anger expression and attention focus: Learning to wait. *Developmental Psychology*, *47*(4), 1078–1089. doi: 10.1037/a0023813

Coles, Robert. (1997). *The moral intelligence of children: How to raise a moral child*. New York, NY: Random House.

Colson, Eve R.; Willinger, Marian; Rybin, Denis; Heeren, Timothy; Smith, Lauren A.; Lister, George & Corwin, Michael J. (2013). Trends and factors associated with infant bed sharing, 1993–2010: The National Infant Sleep Position study. *JAMA Pediatrics*, *167*(11), 1032–1037. doi: 10.1001/jamapediatrics.2013.2560

Common Sense Media. (2011). *Zero to eight: Children's media use in America*. San Francisco, CA: Common Sense.

Complaints.com. (2011, April 3).

Confer, Jaime C.; Easton, Judith A.; Fleischman, Diana S.; Goetz, Cari D.; Lewis, David M. G.; Perilloux, Carin & Buss, David M. (2010). Evolutionary psychology

Controversies, questions, prospects, and limitations. *American Psychologist*, 65(2), 110–126. doi: 10.1037/a0018413

Conger, John J. (1975). Proceedings of the American Psychological Association, Incorporated, for the year 1974: Minutes of the annual meeting of the Council of Representatives. *American Psychologist*, 30(6), 620–651. doi: 10.1037/h0078455

Conwell, Erin & Morgan, James L. (2012). Is it a noun or is it a verb? Resolving the ambicategoricality problem. *Language Learning and Development*, 8(2), 87–112. doi: 10.1080/15475441.2011.580236

Coon, Carleton S. (1962). *The origin of races*. New York, NY: Knopf.

Coovadia, Hoosen M. & Wittenberg, Dankwart F. (Eds.). (2004). *Paediatrics and child health: A manual for health professionals in developing countries* (5th ed.). New York, NY: Oxford University Press.

Copeland, William E.; Wolke, Dieter; Angold, Adrian & Costell, E. Jane. (2013). Adult psychiatric outcomes of bullying and being bullied by peers in childhood and adolescence. *JAMA Psychiatry*, 70(4), 419–426. doi: 10.1001/jamapsychiatry.2013.504

Copen, Casey E.; Daniels, Kimberly & Mosher, William D. (2013). *First premarital cohabitation in the United States: 2006–2010 national survey of family growth*. Hyattsville, MD U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics.

Coplan, Robert J. & Weeks, Murray. (2009). Shy and soft-spoken: Shyness, pragmatic language, and socio-emotional adjustment in early childhood. *Infant and Child Development*, 18(3), 238–254. doi: 10.1002/icd.622

Corballis, Michael C. (2011). *The recursive mind: The origins of human language, thought, and civilization*. Princeton, NJ: Princeton University Press.

Corda, Larisa; Khanapure, Amita & Karoshi, Mahantesh. (2012). Biopanic, advanced maternal age and fertility outcomes. In Mahantesh Karoshi, et al. (Eds.), *A Textbook of Preconceptional Medicine and Management*. London, UK: Sapiens.

Corenblum, Barry. (2014). Relationships between racial ethnic identity, self-esteem and in-group attitudes among first nation children. *Journal of Youth and Adolescence*, 43(3), 387–404. doi: 10.1007/s10964-013-0081-8

Costa, Albert & Sebastián-Gallés, Núria. (2014). How does the bilingual experience sculpt the brain? *Nature Reviews Neuroscience*, 15(5), 336–345. doi: 10.1038/nrn3709

Côté, Sylvana M.; Borge, Anne I.; Geoffroy, Marie-Claude; Rutter, Michael & Tremblay, Richard E. (2008). Nonmaternal care in infancy and emotional/behavioral difficulties at 4 years old: Moderation by family risk characteristics. *Developmental Psychology*, 44(1), 155–168. doi: 10.1037/0012-1649.44.1.155

Cotton, Richard. (2014). Supporting transgender students in schools. *British Journal of School Nursing*, 9(3), 141–143. doi: 10.12968/bjsn.2014.9.3.141

Couzin-Frankel, Jennifer. (2010). Bacteria and asthma: Untangling the links. *Science*, 330(6008), 1168–1169. doi: 10.1126/science.330.6008.1168

Couzin-Frankel, Jennifer. (2011). A pitched battle over life span. *Science*, 333(6042), 549–550. doi: 10.1126/science.333.6042.549

Couzin-Frankel, Jennifer. (2013). Return of unexpected DNA results urged. *Science*, 339(6127), 1507–1508. doi: 10.1126/science.339.6127.1507

Cowan, Nelson (Ed.). (1997). *The development of memory in childhood*. Hove, East Sussex, UK: Psychology Press.

Cowan, Nelson & Alloway, Tracy. (2009). Development of working memory in childhood. In Mary L. Courage & Nelson Cowan (Eds.), *The development of memory in infancy and childhood* (2nd ed., pp. 303–342). New York, NY: Psychology Press.

Crain, William C. (2005). *Theories of development: Concepts and applications* (5th ed.). Upper Saddle River, NJ: Prentice Hall.

Cramer, Robert; Lipinski, Ryan; Bowman, Ashley & Carollo, Tanner. (2009). Subjective distress to violations of trust in Mexican American close relationships conforms to evolutionary principles. *Current Psychology*, 28(1), 1–11. doi: 10.1007/s12144-009-9049-y

Cristia, Alejandrina; Seidl, Amanda; Junge, Caroline; Soderstrom, Melanie & Hagoort, Peter. (2014). Predicting individual variation in language from infant speech perception measures. *Child Development*, 85(4), 1330–1345. doi: 10.1111/cdev.12193

Crone, Eveline A. & Ridderinkhof, K. Richard. (2011). The developing brain: From theory to neuroimaging and back. *Developmental Cognitive Neuroscience*, 1(2), 101–109. doi: 10.1016/j.dcn.2010.12.001

Crone, Eveline A. & Westenberg, P. Michiel. (2009). A brain-based account of developmental changes in social decision making. In Michelle de Haan & Megan R. Gunnar (Eds.), *Handbook of developmental social neuroscience* (pp. 378–396). New York, NY: Guilford Press.

Crosnoe, Robert & Johnson, Monica Kirkpatrick. (2011). Research on adolescence in the twenty-first century. *Annual Review of Sociology*, 37(1), 439–460. doi: 10.1146/annurev-soc-081309-150008

Crosnoe, Robert; Leventhal, Tama; Wirth, Robert John; Pierce, Kim M. & Pianta, Robert C. (2010). Family socioeconomic status and consistent environmental stimulation in early childhood. *Child Development*, 81(3), 972–987. doi: 10.1111/j.1467-8624.2010.01446.x

Cross, Donna; Monks, Helen; Hall, Marg; Shaw, Thérèse; Pintabona, Yolanda; Erceg, Erin, . . . Lester, Leanne. (2011). Three-year results of the Friendly Schools whole-of-school intervention on children's bullying behaviour. *British Educational Research Journal*, 37(1), 105–129. doi: 10.1080/01411920903420024

Crossley, Nicolas A.; Mechelli, Andrea; Scott, Jessica; Carletti, Francesco; Fox, Peter T.; McGuire, Philip & Bullmore, Edward T. (2014). The hubs of the human connectome are generally implicated in the anatomy of brain disorders. *Brain*, 137(8), 2382–2395. doi: 10.1093/brain/awu132

Cruz, Alvaro A.; Bateman, Eric D. & Bousquet, Jean. (2010). The social determinants of asthma. *European Respiratory Journal*, 35(2), 239–242. doi: 10.1183/09031936.00070309

Cruz-Inigo, Andres E.; Ladizinski, Barry & Sethi, Aisha. (2011). Albinism in Africa: Stigma, slaughter and awareness campaigns. *Dermatologic Clinics*, 29(1), 79–87. doi: 10.1016/j.det.2010.08.015

Cubillo, Ana; Halari, Rozmin; Smith, Anna; Taylor, Eric & Rubia, Katya. (2012). A review of fronto-striatal and fronto-cortical brain abnormalities in children and adults with Attention deficit hyperactivity disorder (ADHD) and new evidence for dysfunction in adults with ADHD during motivation and attention. *Cortex*, 48(2), 194–215. doi: 10.1016/j.cortex.2011.04.007

Cuijpers, P.; van Straten, A.; van Oppen, P. & Andersson, G. (2010). Welke psychologische behandeling, uitgevoerd door wie, is het meest effectief bij depressie? *Gedragstherapie*, 43, 79–113.

Currie, Janet & Widom, Cathy S. (2010). Long-term consequences of child abuse and neglect on adult economic well-being. *Child Maltreatment*, 15(2), 111–120. doi: 10.1177/1077559509355316

Cutuli, J. J.; Desjardins, Christopher David; Herbers, Janette E.; Long, Jeffrey D.; Heistad, David; Chan, Chi-Keung, . . . Masten, Ann S. (2013). Academic achievement trajectories of homeless and highly mobile students: Resilience in the context of chronic and acute risk. *Child Development*, 84(3), 841–857. doi: 10.1111/cdev.12013

Dai, David Yun. (2010). *The nature and nurture of giftedness: A new framework for understanding gifted education*. New York, NY: Teachers College Press.

Daley, Dave; Jones, Karen; Hutchings, Judy & Thompson, Margaret. (2009). Attention deficit hyperactivity disorder in pre-school children: Current findings, recommended interventions and future directions. *Child: Care, Health and Development*, 35(6), 754–766. doi: 10.1111/j.1365-2214.2009.00938.x

Dalman, Christina; Allebeck, Peter; Gunnell, David; Harrison, Glyn; Kristensson, Krister; Lewis, Glyn, . . . Karlsson, Håkan. (2008). Infections in the CNS during childhood and the risk of subsequent psychotic illness: A cohort study of more than one million Swedish subjects. *American Journal of Psychiatry*, 165(1), 59–65. doi: 10.1176/appi.ajp.2007.07050740

Damashek, Amy & Kuhn, Jennifer. (2014). Promise and challenges: Interventions for the prevention of unintentional injuries among young

children. *Clinical Practice in Pediatric Psychology*, 2(3), 250–262. doi: 10.1037/cpp0000064

Damasio, Antonio R. (2012). *Self comes to mind: Constructing the conscious brain*. New York, NY: Vintage.

Danel, Isabella; Berg, Cynthia; Johnson, Christopher H. & Atrash, Hani. (2003). Magnitude of maternal morbidity during labor and delivery: United States, 1993 1997. *American Journal of Public Health*, 93(4), 631–634. doi: 10.2105/AJPH.93.4.631

Darwin, Charles. (1859). *On the origin of species by means of natural selection*. London, UK: J. Murray.

Daum, Moritz M.; Ulber, Julia & Gredebäck, Gustaf. (2013). The development of pointing perception in infancy: Effects of communicative signals on covert shifts of attention. *Developmental Psychology*, 49(10), 1898–1908. doi: 10.1037 a0031111

David, Barbara; Grace, Diane & Ryan, Michelle K. (2004). The gender wars: A self-categorization perspective on the development of gender identity. In Mark Bennett & Fabio Sani (Eds.), *The development of the social self* (pp. 135–157). New York, NY: Psychology Press.

Davis, Elysia Poggi; Parker, Susan W.; Tottenham, Nim & Gunnar, Megan R. (2003). Emotion, cognition, and the hypothalamic-pituitary-adrenocortical axis: A developmental perspective. In Michelle de Haan & Mark H. Johnson (Eds.), *The cognitive neuroscience of development* (pp. 181–206). New York, NY: Psychology Press.

Davis, Linell. (1999). *Doing culture: Cross-cultural communication in action*. Beijing, China: Foreign Language Teaching & Research Press.

Davis, R. Neal; Davis, Matthew M.; Freed, Gary L. & Clark, Sarah J. (2011). Fathers' depression related to positive and negative parenting behaviors with 1-year-old children. *Pediatrics*, *127*(4), 612–618. doi: 10.1542/peds.2010-1779

Davis-Kean, Pamela E.; Jager, Justin & Collins, W. Andrew. (2009). The self in action: An emerging link between self-beliefs and behaviors in middle childhood. *Child Development Perspectives*, 3(3), 184–188. doi: 10.1111/j.1750-8606.2009.00104.x

Dawson, Geraldine; Jones, Emily J. H.; Merkle, Kristen; Venema, Kaitlin; Lowy, Rachel; Faja, Susan, . . . Webb, Sara J. (2012). Early behavioral intervention is associated with normalized brain activity in young children with autism. *Journal of the American Academy of Child & Adolescent Psychiatry*, 51(11), 1150–1159. doi: 10.1016/j.jaac.2012.08.018

De Cock, Kevin M. (2011). *Trends in global health and CDC's international role, 1961–2011*. Atlanta, GA: Centers for Disease Control and Prevention, *60*(Suppl. 4), 104–111.

De Corte, Erik. (2013). Giftedness considered from the perspective of research on learning and instruction. *High Ability Studies*, *24*(1), 3–19. doi: 10.1080/13598139.2013.780967

de Haan, Amaranta D.; Prinzie, Peter & Dekovic, Maja. (2009). Mothers' and fathers' personality and parenting: The mediating role of sense of competence. *Developmental Psychology*, *45*(6), 1695 1707. doi: 10.1037/a0016121

de Heering, Adelaide; de Liedekerke, Claire; Deboni, Malorie & Rossion, Bruno. (2010). The role of experience during childhood in shaping the other-race effect. *Developmental Science*, *13*(1), 181–187. doi: 10.1111/j.1467-7687.2009.00876.x

de Hoog, Marieke L. A.; Kleinman, Ken P.; Gillman, Matthew W.; Vrijkotte, Tanja G. M.; van Eijsden, Manon & Taveras, Elsie M. (2014). Racial/ethnic and immigrant differences in early childhood diet quality. *Public Health Nutrition*, *17*(6), 1308–1317. doi: 10.1017/S1368980013001183

de Jonge, Ank; Mesman, Jeanette A. J. M.; Manniën, Judith; Zwart, Joost J.; van Dillen, Jeroen & van Roosmalen, Jos. (2013). Severe adverse maternal outcomes among low risk women with planned home versus hospital births in the Netherlands: Nationwide cohort study. *BMJ*, *346*, f3263. doi: 10.1136/bmj.f3263

de la Croix, David. (2013). *Fertility, education, growth, and sustainability*. New York, NY Cambridge University Press.

De Lee, Joseph Bolivar. (1938). *The principles and practice of obstetrics* (7th ed.). Philadelphia, PA: W. B. Saunders Co.

de Weerth, Carolina; Zijlmans, Maartje; Mack, Simon & Beijers, Roseriet. (2013). Cortisol reactions to a social evaluative paradigm in 5- and 6-year-old children. *Stress*, *16*(1), 65–72. doi: 10.3109/10253890.2012.684112

Dean, Angela J.; Walters, Julie & Hall, Anthony. (2010). A systematic review of interventions to enhance medication adherence in children and adolescents with chronic illness. *Archives of Disease in Childhood*, 95(9), 717–723. doi: 10.1136/adc.2009.175125

Dearing, Eric; Wimer, Christopher; Simpkins, Sandra D.; Lund, Terese; Bouffard, Suzanne M.; Caronongan, Pia, . . . Weiss, Heather. (2009). Do neighborhood and home contexts help explain why low-income children miss opportunities to participate in activities outside of school? *Developmental Psychology*, *45*(6), 1545–1562. doi: 10.1037/a0017359

Deater-Deckard, Kirby. (2013). The social environment and the development of psychopathology. In Philip D. Zelazo (Ed.), *The Oxford handbook of developmental psychology* (Vol. 2, pp. 527–548). New York, NY: Oxford University Press. doi: 10.1093/oxfordhb/9780199958474.013.0021

Deci, Edward L.; Koestner, Richard & Ryan, Richard M. (1999). A meta-analytic review of experiments examining the effects of extrinsic rewards on intrinsic motivation. *Psychological Bulletin*, *125*(6), 627–668. doi: 10.1037//0033-2909.125.6.627

Dee, Thomas; Jacob, Brian A. & Schwartz, Nathaniel. (2013). The effects of NCLB on school resources and practices. *Educational Evaluation and Policy Analysis*, 35(2), 252–279. doi: 10.3102/0162373712467080

Degnan, Kathryn A.; Hane, Amie Ashley; Henderson, Heather A.; Moas, Olga Lydia; Reeb-Sutherland, Bethany C. & Fox, Nathan A. (2011). Longitudinal stability of temperamental exuberance and social–emotional outcomes in early childhood. *Developmental Psychology*, *47*(3), 765–780. doi: 10.1037/a0021316

DeKeyser, Robert M. (2013). Age effects in second language learning: Stepping stones toward better understanding. *63*(Suppl. 1), 52–67. doi: 10.1111/j.1467-9922.2012.00737.x

Delaunay-El Allam, Maryse; Soussignan, Robert; Patris, Bruno; Marlier, Luc & Schaal, Benoist. (2010). Long-lasting memory for an odor acquired at the mother's breast. *Developmental Science*, *13*(6), 849–863. doi: 10.1111/j.1467-7687.2009.00941.x

DeLisi, Matt. (2014). Low self-control is a brain-based disorder. In Kevin M. Beaver, et al. (Eds.), *The nurture versus biosocial debate in criminology: On the origins of criminal behavior and criminality* (pp. 172–183). Thousand Oaks, CA: Sage.

DeLoache, Judy S.; Chiong, Cynthia; Sherman, Kathleen; Islam, Nadia; Vanderborght, Mieke; Troseth, Georgene L., . . . O'Doherty, Katherine. (2010). Do babies learn from baby media? *Psychological Science*, *21*(11), 1570–1574. doi: 10.1177/0956797610384145

Demetriou, Andreas; Spanoudis, George; Shayer, Michael; Mouyi, Antigoni; Kazi, Smaragda & Platsidou, Maria. (2013). Cycles in speed-working memory-G relations: Towards a developmental–differential theory of the mind. *Intelligence*, *41*(1), 34–50. doi: 10.1016/j.intell.2012.10.010

Demorest, Amy P. (2004). *Psychology's grand theorists: How personal experiences shaped professional ideas*. New York: Psychology Press.

Desai, Rishi J.; Hernandez-Diaz, Sonia; Bateman, Brian T. & Huybrechts, Krista F. (2014). Increase in prescription opioid use during pregnancy among medicaid-enrolled women. *Obstetrics & Gynecology*, *123*(5), 997–1002. doi: 10.1097/AOG.0000000000000208

Desoete, Annemie; Stock, Pieter; Schepens, Annemie; Baeyens, Dieter & Roeyers, Herbert. (2009). Classification, seriation, and counting in grades 1, 2, and 3 as two-year longitudinal predictors for low achieving in numerical facility and arithmetical achievement? *Journal of Psychoeducational Assessment*, 27(3), 252–264. doi: 10.1177/0734282908330588

Diamond, Lisa M. & Fagundes, Christopher P. (2010). Psychobiological research on attachment. *Journal of Social and Personal Relationships*, 27(2), 218–225. doi: 10.1177/0265407509360906

Diamond, Marian C. (1988). *Enriching heredity: The impact of the environment on the anatomy of the brain*. New York, NY: Free Press.

Diamond, Mathew E. (2007). Neuronal basis of perceptual intelligence. In Flavia Santoianni & Claudia Sabatano (Eds.), *Brain development in learning environments: Embodied and perceptual advancements* (pp. 98–108). Newcastle, UK: Cambridge Scholars Publishing.

Diener, Marissa. (2000). Gift from the gods: A Balinese guide to early child rearing. In Judy S. DeLoache & Alma Gottlieb (Eds.), *A world of babies: Imagined childcare guides for seven societies* (pp. 96–116). New York, NY: Cambridge University Press.

Dinh, Michael M.; Bein, Kendall; Roncal, Susan; Byrne, Christopher M.; Petchell, Jeffrey & Brennan, Jeffrey. (2013). Redefining the golden hour for severe head injury in an urban setting: The effect of prehospital arrival times on patient outcomes. *Injury, 44*(5), 606–610. doi: 10.1016/j.injury.2012.01.011

Dix, Theodore & Yan, Ni. (2014). Mothers' depressive symptoms and infant negative emotionality in the prediction of child adjustment at age 3: Testing the maternal reactivity and child vulnerability hypotheses. *Development and Psychopathology, 26*(1), 111–124. doi: 10.1017/S0954579413000898

Dobson, Velma; Candy, T. Rowan; Hartmann, E. Eugenie; Mayer, D. Luisa; Miller, Joseph M. & Quinn, Graham E. (2009). Infant and child vision research: Present status and future directions. *Optometry & Vision Science, 86*(6), 559–560. doi: 10.1097/OPX.0b013e3181aa06d5

Dodge, Kenneth A. (2009). Mechanisms of gene-environment interaction effects in the development of conduct disorder. *Perspectives on Psychological Science, 4*(4), 408–414. doi: 10.1111/j.1745-6924.2009.01147.x

dosReis, Susan; Mychailyszyn, Matthew P.; Evans-Lacko, Sara E.; Beltran, Alicia; Riley, Anne W. & Myers, Mary Anne. (2009). The meaning of Attention-deficit/hyperactivity disorder medication and parents' initiation and continuity of treatment for their child. *Journal of Child and Adolescent Psychopharmacology, 19*(4), 377–383. doi: 10.1089/cap.2008.0118

Drabant, Emily M.; Ramel, Wiveka; Edge, Michael D.; Hyde, Luke W.; Kuo, Janice R.; Goldin, Philippe R., . . . Gross, James J. (2012). Neural mechanisms underlying 5-HTTLPR-related sensitivity to acute stress. *Psychiatry Online, 169*(4), 397–405. doi: 10.1176/appi.ajp.2011.10111699

Drake, Kim; Belsky, Jay & Fearon, R. M. Pasco. (2014). From early attachment to engagement with learning in school: The role of self-regulation and persistence. *Developmental Psychology, 50*(5), 1350–1361. doi: 10.1037/a0032779

Drescher, Jack. (2014). Controversies in gender diagnoses. *LGBT Health, 1*(1), 10–14. doi: 10.1089/lgbt.2013.1500

Drover, James; Hoffman, Dennis R.; Castañeda, Yolanda S.; Morale, Sarah E. & Birch, Eileen E. (2009). Three randomized controlled trials of early long-chain polyunsaturated fatty acid supplementation on means-end problem solving in 9-month-olds. *Child Development, 80*(5), 1376–1384. doi: 10.1111/j.1467-8624.2009.01339.x

Dubicka, Bernadka; Carlson, Gabrielle A.; Vail, Andy & Harrington, Richard. (2008). Prepubertal mania: Diagnostic differences between US and UK clinicians. *European Child & Adolescent Psychiatry, 17*(3), 153–161. doi: 10.1007/s00787-007-0649-5

Duckworth, Angela Lee & Kern, Margaret L. (2011). A meta-analysis of the convergent validity of self-control measures. *Journal of Research in Personality, 45*(3), 259–268. doi: 10.1016/j.jrp.2011.02.004

Dukes, Richard L.; Stein, Judith A. & Zane, Jazmin I. (2009). Effect of relational bullying on attitudes, behavior and injury among adolescent bullies, victims and bully-victims. *The Social Science Journal, 46*(4), 671–688. doi: 10.1016/j.soscij.2009.05.006

Dumas, A.; Simmat-Durand, L. & Lejeune, C. (2014). Pregnancy and substance use in France: A literature review. *Journal de Gynécologie Obstétrique et Biologie de la Reproduction*. doi 10.1016/j.jgyn.2014.05.008

Duncan, Greg J. & Magnuson, Katherine. (2013). Investing in preschool programs. *Journal of Economic Perspectives, 27*(2), 109–132. doi: 10.1257/jep.27.2.109

Duncan, Greg J.; Ziol-Guest, Kathleen M. & Kalil, Ariel. (2010). Early-childhood poverty and adult attainment, behavior, and health. *Child Development, 81*(1), 306–325. doi: 10.1111/j.1467-8624.2009.01396.x

Dunmore, Simon J. (2013). Of fat mice and men: The rise of the adipokines. *Journal of Endocrinology, 216*(1), E1–E2. doi: 10.1530/JOE-12-0513

Dunning, David. (2011). *Social motivation*. New York, NY: Psychology Press.

DuPaul, George J.; Gormley, Matthew J. & Laracy, Seth D. (2013). Comorbidity of LD and ADHD: Implications of DSM-5 for assessment and treatment. *Journal of Learning Disabilities, 46*(1), 43–51. doi: 10.1177/0022219412464351

DuPont, Robert L. & Lieberman, Jeffrey A. (2014). Young brains on drugs. *Science, 344*(6184), 557. doi: 10.1126/science.1254989

Dutra, Lauren M. & Glantz, Stanton A. (2014). Electronic cigarettes and conventional cigarette use among US adolescents: A cross-sectional study. *JAMA Pediatrics, 168*(7), 610–617. doi: 10.1001/jamapediatrics.2013.5488

Dweck, Carol S. (2013). Social Development. In Philip D. Zelazo (Ed.), *The Oxford handbook of developmental psychology* (Vol. 2, pp. 167–190). New York, NY: Oxford University Press. doi: 10.1093/oxfordhb/9780199958474.013.0008

Eagly, Alice H. & Wood, Wendy. (2013). The nature–nurture debates: 25 years of challenges in understanding the psychology of gender. *Perspectives on Psychological Science, 8*(3), 340–357. doi: 10.1177/1745691613484767

Earth Policy Institute. (2011). *Two stories of disease: Smallpox and polio*. Washington, DC: Earth Policy Institute.

Eckholm, Erik. (2013, October 24). Case explores rights of fetus versus mother. *The New York Times*, pp. A1, A16.

Edwards, Judge Leonard P. (2007). Achieving timely permanency in child protection courts: The importance of frontloading the court process. *Juvenile and Family Court Journal, 58*(2), 1–37. doi: 10.1111/j.1755-6988.2007.tb00136.x

Efrat, Merav. (2011). The relationship between low-income and minority children's physical activity and academic-related outcomes: A review of the literature. *Health Education & Behavior, 38*(5), 441–451. doi: 10.1177/1090198110375025

Eggum, Natalie D.; Eisenberg, Nancy; Kao, Karen; Spinrad, Tracy L.; Bolnick, Rebecca; Hofer, Claire, . . . Fabricius, William V. (2011). Emotion understanding, theory of mind, and prosocial orientation: Relations over time in early childhood. *The Journal of Positive Psychology, 6*(1), 4–16. doi: 10.1080/17439760.2010.536776

Ehrlich, Sara Z. & Blum-Kulka, Shoshana. (2014). 'Now I said that Danny becomes Danny again': A multifaceted view of kindergarten children's peer argumentative discourse. In Asta Cekaite, et al. (Eds.), *Children's peer talk: Learning from each other* (pp. 23–41). New York, NY: Cambridge University Press.

Eisenberg, Nancy; Hofer, Claire; Sulik, Michael J. & Liew, Jeffrey. (2013). The development of prosocial moral reasoning and a prosocial orientation in young adulthood: Concurrent and longitudinal correlates. *Developmental Psychology, 50*(1), 58–70. doi: 10.1037/a0032990

Eisenberg, Nancy; Hofer, Claire; Sulik, Michael J. & Spinrad, Tracy L. (2014). Self-regulation, effortful control, and their socioemotional correlates. In James J. Gross (Ed.), *Handbook of emotion regulation* (2nd ed., pp. 157–172). New York, NY: Guilford Press.

Elicker, James; Ruprecht, Karen M. & Anderson, Treshawn. (2014). Observing infants' and toddlers' relationships and interactions in group care. In Linda J. Harrison & Jennifer Sumsion (Eds.), *Lived spaces of infant-toddler education and care: Exploring diverse perspectives on theory, research and practice* (pp. 131–145). Dordrecht, Netherlands: Springer. doi: 10.1007/978-94-017-8838-0_10

Elkind, David. (2007). *The power of play: How spontaneous, imaginative activities lead to happier, healthier children*. Cambridge, MA: Da Capo Press.

Ellingsaeter, Anne L. (2014). Towards universal quality early childhood education and care: The Norwegian model. In Ludovica Gambaro, et al. (Eds.), *An equal start?: Providing quality early education and care for disadvantaged children* (pp. 53–76). Chicago, IL: Policy Press.

Ellis, Bruce J. & Boyce, W. Thomas. (2008). Biological sensitivity to context. *Current Directions in Psychological Science, 17*(3), 183–187. doi: 10.1111/j.1467-8721.2008.00571.x

Ellis, Bruce J.; Del Giudice, Marco; Dishion, Thomas J.; Figueredo, Aurelio José; Gray, Peter; Griskevicius, Vladas, . . . Wilson, David Sloan. (2012). The evolutionary basis of risky adolescent behavior: Implications for science, policy, and practice. *Developmental Psychology, 48*(3), 598–623. doi: 10.1037/a0026220

Ellison, Christopher G.; Musick, Marc A. & Holden, George W. (2011). Does conservative Protestantism moderate the association between corporal punishment and child outcomes? *Journal of Marriage and Family*, 73(5), 946–961. doi: 10.1111/j.1741-3737.2011.00854.x

Emmen, Rosanneke A. G.; Malda, Maike; Mesman, Judi; van IJzendoorn, Marinus H.; Prevoo, Mariëlle J. L. & Yeniad, Nihal. (2013). Socioeconomic status and parenting in ethnic minority families: Testing a minority family stress model. *Journal of Family Psychology*, 27(6), 896–904. doi: 10.1037/a0034693

Engelberts, Adèle C. & de Jonge, Guustaaf Adolf. (1990). Choice of sleeping position for infants: Possible association with cot death. *Archives of Disease in Childhood*, 65(4), 462–467. doi: 10.1136/adc.65.4.462

Enserink, Martin. (2011). Can this DNA sleuth help catch criminals? *Science*, 331(6019), 838–840. doi: 10.1126/science.331.6019.838

Epps, Chad & Holt, Lynn. (2011). The genetic basis of addiction and relevant cellular mechanisms. *International Anesthesiology Clinics*, 49(1), 3–14. doi: 10.1097/AIA.0b013e3181f2bb66

Epstein, Jeffery N.; Langberg, Joshua M.; Lichtenstein, Philip K.; Altaye, Mekibib; Brinkman, William B.; House, Katherine & Stark, Lori J. (2010). Attention-deficit/hyperactivity disorder outcomes for children treated in community-based pediatric settings. *Archives of Pediatrics & Adolescent Medicine*, 164(2), 160–165. doi: 10.1001/archpediatrics.2009.263

Erdman, Phyllis & Ng, Kok-Mun (Eds.). (2010). *Attachment: Expanding the cultural connections*. New York, NY: Routledge.

Erdos, Caroline; Genesee, Fred; Savage, Robert & Haigh, Corinne. (2014). Predicting risk for oral and written language learning difficulties in students educated in a second language. *Applied Psycholinguistics*, 35(2), 371–398. doi: 10.1017/S0142716412000422

Erikson, Erik H. (1963). *Childhood and society* (2nd ed.). New York, NY: Norton.

Erskine, Holly E.; Ferrari, Alize J.; Nelson, Paul; Polanczyk, Guilherme V.; Flaxman, Abraham D.; Vos, Theo, . . . Scott, James G. (2013). Research Review: Epidemiological modelling of Attention-deficit/hyperactivity disorder and conduct disorder for the Global Burden of Disease Study 2010. *Journal of Child Psychology and Psychiatry*, 54(12), 1263–1274. doi: 10.1111/jcpp.12144

Evans, Angela D.; Xu, Fen & Lee, Kang. (2011). When all signs point to you: Lies told in the face of evidence. *Developmental Psychology*, 47(1), 39–49. doi: 10.1037/a0020787

Evans, Gary W. & Kim, Pilyoung. (2013). Childhood poverty, chronic stress, self-regulation, and coping. *Child Development Perspectives*, 7(1), 43–48. doi: 10.1111/cdep.12013

Evans, M. D. R.; Kelley, Jonathan; Sikora, Joanna & Treiman, Donald J. (2010). Family scholarly culture and educational success: Books and schooling in 27 nations. *Research in Social Stratification and Mobility*, 28(2), 171–197. doi: 10.1016/j.rssm.2010.01.002

Eyer, Diane E. (1992). *Mother-infant bonding: A scientific fiction*. New Haven, CT: Yale University Press.

Fairhurst, Merle T.; Löken, Line & Grossmann, Tobias. (2014). Physiological and behavioral responses reveal 9-month-old infants' sensitivity to pleasant touch. *Psychological Science*, 25(5), 1124–1131. doi: 10.1177/0956797614527114

Falconi, A.; Gemmill, A.; Dahl, R. E. & Catalano, R. (2014). Adolescent experience predicts longevity: evidence from historical epidemiology. *Journal of Developmental Origins of Health and Disease*, 5(3), 171–177. doi: 10.1017/S2040174414000105

Farahani, Mansour; Subramanian, S. V. & Canning, David. (2009). The effect of changes in health sector resources on infant mortality in the short-run and the long-run: A longitudinal econometric analysis. *Social Science & Medicine*, 68(11), 1918–1925. doi: 10.1016/j.socscimed.2009.03.023

Fauser, B. C. J. M.; Devroey, P.; Diedrich, K.; Balaban, B.; Bonduelle, M.; Delemarre-van de Waal, H. A., . . . Wells, D. (2014). Health outcomes of children born after IVF/ICSI: A review of current expert opinion and literature. *Reproductive BioMedicine Online*, 28(2), 162–182. doi: 10.1016/j.rbmo.2013.10.013

Fazzi, Elisa; Signorini, Sabrina G.; Bomba, Monica; Luparia, Antonella; Lanners, Josée & Balottin, Umberto. (2011). Reach on sound: A key to object permanence in visually impaired children. *Early Human Development*, 87(4), 289–296. doi: 10.1016/j.earlhumdev.2011.01.032

Feeley, Nancy; Sherrard, Kathyrn; Waitzer, Elana & Boisvert, Linda. (2013). The father at the bedside: Patterns of involvement in the NICU. *Journal of Perinatal & Neonatal Nursing*, 27(1), 72–80. doi: 10.1097/JPN.0b013e31827fb415

Feigenson, Lisa; Libertus, Melissa E. & Halberda, Justin. (2013). Links between the intuitive sense of number and formal mathematics ability. *Child Development Perspectives*, 7(2), 74–79. doi: 10.1111/cdep.12019

Feldman, Ruth. (2007). Parent-infant synchrony and the construction of shared timing; Physiological precursors, developmental outcomes, and risk conditions. *Journal of Child Psychology and Psychiatry*, 48(3/4), 329–354. doi: 10.1111/j.1469-7610.2006.01701.x

Feldman, Ruth; Gordon, Ilanit & Zagoory-Sharon, Orna. (2011). Maternal and paternal plasma, salivary, and urinary oxytocin and parent-infant synchrony: Considering stress and affiliation components of human bonding. *Developmental Science*, 14(4), 752–761. doi: 10.1111/j.1467-7687.2010.01021.x

Feldman, Ruth; Weller, Aron; Sirota, Lea & Eidelman, Arthur I. (2002). Skin-to-skin contact (kangaroo care) promotes self-regulation in premature infants: Sleep-wake cyclicity, arousal modulation, and sustained exploration. *Developmental Psychology*, 38(2), 194–207. doi: 10.1037//0012-1649.38.2.194

Feltis, Brooke B.; Powell, Martine B.; Snow, Pamela C. & Hughes-Scholes, Carolyn H. (2010). An examination of the association between interviewer question type and story-grammar detail in child witness interviews about abuse. *Child Abuse & Neglect*, 34(6), 407–413. doi: 10.1016/j.chiabu.2009.09.019

Feng, Xing Lin; Wang, Ying; An, Lin & Ronsmans, Carine. (2014). Cesarean section in the People's Republic of China: Current perspectives. *International Journal of Women's Health*, 6(1), 59–74. doi: 10.2147/IJWH.S41410

Fentiman, Linda C. (2009). Pursuing the perfect mother: Why America's criminalization of maternal substance abuse is not the answer – A comparative legal analysis. *Michigan Journal of Gender & Law*, 15(2).

Ferber, Sari G. & Makhoul, Imad R. (2004). The effect of skin-to-skin contact (kangaroo care) shortly after birth on the neurobehavioral responses of the term newborn: A randomized, controlled trial. *Pediatrics*, 113(4), 858–865. doi: 10.1542/peds.113.4.858

Ferguson, Christopher J. (2013). Spanking, corporal punishment and negative long-term outcomes: A meta-analytic review of longitudinal studies. *Clinical Psychology Review*, 33(1), 196–208. doi: 10.1016/j.cpr.2012.11.002

Ferguson, Christopher J. & Donnellan, M. Brent. (2014). Is the association between children's baby video viewing and poor language development robust? A reanalysis of Zimmerman, Christakis, and Meltzoff (2007). *Developmental Psychology*, 50(1), 129–137. doi: 10.1037/a0033628

Ferguson, Gail M.; Iturbide, Maria I. & Gordon, Beverly P. (2014). Tridimensional (3d) acculturation: Ethnic identity and psychological functioning of tricultural Jamaican immigrants. *International Perspectives in Psychology: Research, Practice, Consultation*, 3(4), 238–251. doi: 10.1037/ipp0000019

Fewtrell, Mary; Wilson, David C.; Booth, Ian & Lucas, Alan. (2011). Six months of exclusive breast feeding: How good is the evidence? *BMJ*, 342, c5955. doi: 10.1136/bmj.c5955

Figueiredo, B.; Canário, C. & Field, T. (2014). Breastfeeding is negatively affected by prenatal depression and reduces postpartum depression. *Psychological Medicine*, 44(5), 927–936. doi: 10.1017/S0033291713001530

Fildes, Alison; van Jaarsveld, Cornelia H. M.; Llewellyn, Clare H.; Fisher, Abigail; Cooke, Lucy & Wardle, Jane. (2014). Nature and nurture in children's food preferences. *The American Journal of Clinical Nutrition*, 99(4), 911–917. doi: 10.3945/ajcn.113.077867

Filová, Barbora; Ostatníková, Daniela; Celec, Peter & Hodosy, Július. (2013). The effect of testosterone on the formation of brain structures. *Cells Tissues Organs*, 197(3), 169–177. doi: 10.1159/000345567

Fine, J. S.; Calello, D. P.; Marcus, S. M. & Lowry, J. A. (2012). 2011 Pediatric fatality review of the National Poison Center Database. *Clinical Toxicology, 50*(10), 872–874. doi: 10.3109/15563650.2012.752494

Finer, Lawrence B. & Zolna, Mia R. (2014). Shifts in intended and unintended pregnancies in the United States, 2001–2008. *American Journal of Public Health, 104*(S1), S43–S48. doi: 10.2105/AJPH.2013.301416

Finn, Amy S.; Kraft, Matthew A.; West, Martin R.; Leonard, Julia A.; Bish, Crystal E.; Martin, Rebecca E., . . . Gabrieli, John D. E. (2014). Cognitive skills, student achievement tests, and schools. *Psychological Science, 25*(3), 736–744. doi: 10.1177/0956797613516008

Fiset, Sylvain & Plourde, Vickie. (2013). Object permanence in domestic dogs (Canis lupus familiaris) and gray wolves (Canis lupus). *Journal of Comparative Psychology, 127*(2), 115–127. doi: 10.1037/a0030595

Fletcher, Erica N.; Whitaker, Robert C.; Marino, Alexis J. & Anderson, Sarah E. (2014). Screen time at home and school among low-income children attending Head Start. *Child Indicators Research, 7*(2), 421–436. doi: 10.1007/s12187-013-9212-8

Fletcher, Jack M. & Vaughn, Sharon. (2009). Response to intervention: Preventing and remediating academic difficulties. *Child Development Perspectives, 3*(1), 30–37. doi: 10.1111/j.1750-8606.2008.00072.x

Fletcher, Richard; St. George, Jennifer & Freeman, Emily. (2013). Rough and tumble play quality: Theoretical foundations for a new measure of father–child interaction. *Early Child Development and Care, 183*(6), 746–759. doi: 10.1080/03004430.2012.723439

Floris, Dorothea L.; Chura, Lindsay R.; Holt, Rosemary J.; Suckling, John; Bullmore, Edward T.; Baron-Cohen, Simon & Spencer, Michael D. (2013). Psychological correlates of handedness and corpus callosum asymmetry in autism: The left hemisphere dysfunction theory revisited. *Journal of Autism and Developmental Disorders, 43*(8), 1758–1772. doi: 10.1007/s10803-012-1720-8

Flynn, James R. (1999). Searching for justice: The discovery of IQ gains over time. *American Psychologist, 54*(1), 5–20. doi: 10.1037/0003-066X.54.1.5

Flynn, James R. (2012). *Are we getting smarter?: Rising IQ in the twenty-first century*. New York, NY: Cambridge University Press.

Forbes, Deborah. (2012). The global influence of the Reggio Emilia Inspiration. In Robert Kelly (Ed.), *Educating for creativity: A global conversation* (pp. 161–172). Calgary, Canada: Brush Education.

Forget-Dubois, Nadine; Dionne, Ginette; Lemelin, Jean-Pascal; Pérusse, Daniel; Tremblay, Richard E. & Boivin, Michel. (2009). Early child language mediates the relation between home environment and school readiness. *Child Development, 80*(3), 736–749. doi: 10.1111/1467-8624.2009.01294.x

Fortuna, Keren & Roisman, Glenn I. (2008). Insecurity, stress, and symptoms of psychopathology: Contrasting results from self-reports versus interviews of adult attachment. *Attachment & Human Development, 10*(1), 11–28. doi: 10.1080/14616730701868571

Foster, Eugene A.; Jobling, Mark A.; Taylor, P. G.; Donnelly, Peter; de Knijff, Peter; Mieremet, Rene, . . . Tyler-Smith, C. (1998). Jefferson fathered slave's last child. *Nature, 396*(6706), 27–28. doi: 10.1038/23835

Fox, Nathan A.; Henderson, Heather A.; Marshall, Peter J.; Nichols, Kate E. & Ghera, Melissa M. (2005). Behavioral inhibition: Linking biology and behavior within a developmental framework. *Annual Review of Psychology, 56*, 235–262. doi: 10.1146/annurev.psych.55.090902.141532

Fox, Nathan A.; Henderson, Heather A.; Rubin, Kenneth H.; Calkins, Susan D. & Schmidt, Louis A. (2001). Continuity and discontinuity of behavioral inhibition and exuberance: Psychophysiological and behavioral influences across the first four years of life. *Child Development, 72*(1), 1–21. doi: 10.1111/1467-8624.00262

Fox, Nathan A.; Reeb-Sutherland, Bethany C. & Degnan, Kathryn A. (2013). Personality and emotional development. In Philip D. Zelazo (Ed.), *The Oxford handbook of developmental psychology* (Vol. 2, pp. 15–44). New York, NY: Oxford University Press. doi: 10.1093/oxfordhb/9780199958474.013.0002

Fragouli, Elpida & Wells, Dagan. (2011). Aneuploidy in the human blastocyst. *Cytogenetic and Genome Research, 133*(2–4), 149–159. doi: 10.1159/000323500

Frankenburg, William K.; Dodds, Josiah; Archer, Philip; Shapiro, Howard & Bresnick, Beverly. (1992). The Denver II: A major revision and restandardization of the Denver Developmental Screening Test. *Pediatrics, 89*(1), 91–97

Franklin, Sarah. (2013). *Biological relatives: IVF, stem cells, and the future of kinship*. Durham, NC: Duke University Press.

Frayling, Timothy M.; Timpson, Nicholas J.; Weedon, Michael N.; Zeggini, Eleftheria; Freathy, Rachel M.; Lindgren, Cecilia M., . . . McCarthy, Mark I. (2007). A common variant in the FTO gene is associated with body mass index and predisposes to childhood and adult obesity. *Science, 316*(5826), 889–894. doi: 10.1126/science.1141634

Frazier, A. Lindsay; Camargo, Carlos A.; Malspeis, Susan; Willett, Walter C. & Young, Michael C. (2014). Prospective study of peripregnancy consumption of peanuts or tree nuts by mothers and the risk of peanut or tree nut allergy in their offspring. *JAMA Pediatrics, 168*(2), 156–162. doi: 10.1001/jamapediatrics.2013.4139

Frazier, Thomas W.; Keshavan, Matcheri S.; Minshew, Nancy J. & Hardan, Antonio Y. (2012). A two-year longitudinal MRI study of the corpus callosum in autism. *Journal of Autism and Developmental Disorders, 42*(11), 2312–2322. doi: 10.1007/s10803-012-1478-z

Freeman, Joan. (2010). *Gifted lives: What happens when gifted children grow up?* New York, NY: Routledge.

Frenda, Steven J.; Nichols, Rebecca M. & Loftus, Elizabeth F. (2011). Current issues and advances in misinformation research. *Current Directions in Psychological Science, 20*(1), 20–23. doi: 10.1177/0963721410396620

Freud, Anna & Burlingham, Dorothy T. (1943). *War and children*. New York, NY: Medical War Books.

Freud, Sigmund. (1935). *A general introduction to psychoanalysis*. New York, NY: Liveright.

Freud, Sigmund. (1938). *The basic writings of Sigmund Freud*. New York, NY: Modern Library.

Freud, Sigmund. (1989). *Introductory lectures on psycho-analysis*. New York, NY: Liveright.

Freud, Sigmund. (1995). *The basic writings of Sigmund Freud*. New York, NY: Modern Library.

Freud, Sigmund. (2001). An outline of psychoanalysis. *The standard edition of the complete psychological works of Sigmund Freud* (Vol. 23). London, UK: Vintage.

Frey, Andy J.; Mandlawitz, Myrna & Alvarez, Michelle. (2012). Leaving NCLB behind. *Children and Schools, 34*(2), 67–69. doi: 10.1093/cs/cds021

Friend, Stephen H. & Schadt, Eric E. (2014). Clues from the resilient. *Science, 344*(6187), 970–972. doi: 10.1126/science.1255648

Fries, Alison B. Wismer & Pollak, Seth D. (2007). Emotion processing and the developing brain. In Donna Coch, et al. (Eds.), *Human behavior, learning, and the developing brain: Atypical development* (pp. 329–361). New York, NY: Guilford Press.

Froiland, John M. & Davison, Mark L. (2014). Parental expectations and school relationships as contributors to adolescents' positive outcomes. *Social Psychology of Education, 17*(1), 1–17. doi: 10.1007/s11218-013-9237-3

Fry, Douglas P. (2014). Environment of evolutionary adaptedness, rough-and-tumble play, and the selection of restraint in human aggression. In Darcia Narvaez, et al. (Eds.), *Ancestral landscapes in human evolution: Culture, childrearing and social wellbeing* (pp. 169–188). New York, NY: Oxford University Press.

Fuligni, Allison Sidle; Howes, Carollee; Huang, Yiching; Hong, Sandra Soliday & Lara-Cinisomo, Sandraluz. (2012). Activity settings and daily routines in preschool classrooms: Diverse experiences in early learning settings for low-income children. *Early Childhood Research Quarterly, 27*(2), 198–209. doi: 10.1016/j.ecresq.2011.10.001

Fuller, Bruce & García Coll, Cynthia. (2010). Learning from Latinos: Contexts, families, and child development in motion. *Developmental Psychology, 46*(3), 559–565. doi: 10.1037/a0019412

Furey, Terrence S. & Sethupathy, Praveen. (2013). Genetics driving epigenetics. *Science, 342*(6159), 705–706. doi: 10.1126/science.1246755

Furukawa, Emi; Tangney, June & Higashibara, Fumiko. (2012). Cross-cultural continuities and discontinuities in shame, guilt, and pride: A study of children residing in Japan, Korea and the USA. *Self and Identity, 11*(1), 90–113. doi: 10.1080/15298868.2010.512748

Fusaro, Maria & Harris, Paul L. (2013). Dax gets the nod: Toddlers detect and use social cues to evaluate testimony. *Developmental Psychology, 49*(3), 514–522. doi: 10.1037/a0030580

Gabrieli, John D. E. (2009). Dyslexia: A new synergy between education and cognitive neuroscience. *Science, 325*(5938), 280–283. doi: 10.1126/science.1171999

Gambaro, Ludovica; Stewart, Kitty & Waldfogel, Jane (Eds.). (2014). *An equal start?: Providing quality early education and care for disadvantaged children*. Chicago, IL: Policy Press.

Ganapathy, Thilagavathy. (2014). Couvade syndrome among 1st time expectant fathers. *Muller Journal of Medical Science Research, 5*(1), 43–47. doi: 10.4103/0975-9727.128944

Gandara, Patricia & Rumberger, Russell W. (2009). Immigration, language, and education: How does language policy structure opportunity? *Teachers College Record, 111*(3), 750–782.

Gandini, Leila; Hill, Lynn; Cadwell, Louise & Schwall, Charles (Eds.). (2005). *In the spirit of the studio: Learning from the atelier of Reggio Emilia*. New York, NY: Teachers College Press.

Gangestad, Steven W. & Simpson, Jeffry A. (Eds.). (2007). *The evolution of mind: Fundamental questions and controversies*. New York, NY: Guilford Press.

Ganong, Lawrence H.; Coleman, Marilyn & Jamison, Tyler. (2011). Patterns of stepchild-stepparent relationship development. *Journal of Marriage and Family, 73*(2), 396–413. doi: 10.1111/j.1741-3737.2010.00814.x

García Coll, Cynthia T. & Marks, Amy K. (2012). *The immigrant paradox in children and adolescents: Is becoming American a developmental risk?* Washington, DC: American Psychological Association.

García, Fernando & Gracia, Enrique. (2009). Is always authoritative the optimum parenting style? Evidence from Spanish families. *Adolescence, 44*(173), 101–131.

Gardner, Howard. (1983). *Frames of mind: The theory of multiple intelligences*. New York, NY: Basic Books.

Gardner, Howard. (1999). Are there additional intelligences? The case for naturalist, spiritual, and existential intelligences. In Jeffrey Kane (Ed.), *Education, information, and transformation: Essays on learning and thinking* (pp. 111–131). Upper Saddle River, NJ: Merrill.

Gardner, Howard. (2006). *Multiple intelligences: New horizons in theory and practice*. New York, NY: Basic Books.

Gardner, Howard & Moran, Seana. (2006). The science of multiple intelligences theory: A response to Lynn Waterhouse. *Educational Psychologist, 41*(4), 227–232. doi: 10.1207/s15326985ep4104_2

Gardner, Paula & Hudson, Bettie L. (1996). *Advance report of final mortality statistics, 1993*. Hyattsville, MD: National Center for Health Statistics, *44*(7, Suppl.).

Gathwala, Geeta; Singh, Bir & Singh, Jagjit. (2010). Effect of Kangaroo Mother Care on physical growth, breastfeeding and its acceptability. *Tropical Doctor, 40*(4), 199–202. doi: 10.1258/td.2010.090513

Gauvain, Mary; Beebe, Heidi & Zhao, Shuheng. (2011). Applying the cultural approach to cognitive development. *Journal of Cognition and Development, 12*(2), 121–133. doi: 10.1080/15248372.2011.563481

Gendron, Brian P.; Williams, Kirk R. & Guerra, Nancy G. (2011). An analysis of bullying among students within schools: Estimating the effects of individual normative beliefs, self-esteem, and school climate. *Journal of School Violence, 10*(2), 150–164. doi: 10.1080/15388220.2010.539166

Genesee, Fred. (2008). Early dual language learning. *Zero to Three, 29*(1), 17–23.

Georgas, James; Berry, John W.; van de Vijver, Fons J. R.; Kagitçibasi, Çigdem & Poortinga, Ype H. (Eds.). (2006). *Families across cultures: A 30-nation psychological study*. New York, NY: Cambridge University Press.

Georgeson, Jan & Payler, Jane (Eds.). (2013). *International perspectives on early childhood education and care*. New York, NY: Open University Press.

Geraerts, Elke; Lindsay, D. Stephen; Merckelbach, Harald; Jelicic, Marko; Raymaekers, Linsey; Arnold, Michelle M. & Schooler, Jonathan W. (2009). Cognitive mechanisms underlying recovered-memory experiences of childhood sexual abuse. *Psychological Science, 20*(1), 92–98. doi: 10.1111/j.1467-9280.2008.02247.x

Gershoff, Elizabeth T. (2013). Spanking and child development: We know enough now to stop hitting our children. *Child Development Perspectives, 7*(3), 133–137. doi: 10.1111/cdep.12038

Gettler, Lee T. & McKenna, James J. (2010). Never sleep with baby? Or keep me close but keep me safe: Eliminating inappropriate safe infant sleep rhetoric in the United States. *Current Pediatric Reviews, 6*(1), 71–77. doi: 10.2174/157339610791317250

Gewertz, Catherine. (2014, August 19). Support slipping for common core, especially among teachers, poll finds [Web log post]. Education week: Curriculum matters. Retrieved from http://blogs.edweek.org/edweek/curriculum/2014/08/education_next_poll_shows_comm.html

Giardino, Angelo P. & Alexander, Randell. (2005). *Child maltreatment: A clinical guide and reference* (3rd ed.). St. Louis, MO: G. W. Medical.

Gibson, Eleanor J. (1969). *Principles of perceptual learning and development*. New York, NY: Appleton-Century-Crofts.

Gibson, Eleanor J. (1988). Exploratory behavior in the development of perceiving, acting, and the acquiring of knowledge. *Annual Review of Psychology, 39*, 1–42. doi: 10.1146/annurev.ps.39.020188.000245

Gibson, Eleanor J. (1997). An ecological psychologist's prolegomena for perceptual development: A functional approach. In Cathy Dent-Read & Patricia Zukow-Goldring (Eds.), *Evolving explanations of development: Ecological approaches to organism-environment systems* (1st ed., pp. 23–54). Washington, DC: American Psychological Association.

Gibson, Eleanor J. & Walk, Richard D. (1960). The "visual cliff". *Scientific American, 202*(4), 64–71. doi: 10.1038/scientificamerican0460-64

Gibson, James J. (1979). *The ecological approach to visual perception*. Boston, MA: Houghton Mifflin.

Gibson-Davis, Christina & Rackin, Heather. (2014). Marriage or carriage? Trends in union context and birth type by education. *Journal of Marriage and Family, 76*(3), 506–519. doi: 10.1111/jomf.12109

Giles, Amy & Rovee-Collier, Carolyn. (2011). Infant long-term memory for associations formed during mere exposure. *Infant Behavior and Development, 34*(2), 327–338. doi: 10.1016/j.infbeh.2011.02.004

Gilles, Floyd H. & Nelson, Marvin D. (2012). *The developing human brain: Growth and adversities*. London, UK: Mac Keith Press.

Gillespie, Michael A. (2010). Players and spectators: Sports and ethical training in the American university. In Elizabeth Kiss & J. Peter Euben (Eds.), *Debating moral education: Rethinking the role of the modern university* (pp. 293–316). Durham, NC: Duke University Press.

Gilliam, Mary; Stockman, Michael; Malek, Meaghan; Sharp, Wendy; Greenstein, Deanna; Lalonde, Francois, . . . Shaw, Philip. (2011). Developmental trajectories of the corpus callosum in Attention-deficit/hyperactivity disorder. *Biological Psychiatry, 69*(9), 839–846. doi: 10.1016/j.biopsych.2010.11.024

Gilligan, Carol. (1982). *In a different voice: Psychological theory and women's development*. Cambridge, MA: Harvard University Press.

Gillis, John R. (2008). The islanding of children: Reshaping the mythical landscapes of childhood. In Marta Gutman & Ning de Coninck-Smith (Eds.), *Designing modern childhoods: History, space, and the material culture of children* (pp. 316–329). New Brunswick, NJ: Rutgers University Press.

Gilroy, Paul. (2000). *Against race: Imagining political culture beyond the color line*. Cambridge, MA: Belknap Press of Harvard University Press.

Giuffrè, Mario; Piro, Ettore & Corsello, Giovanni. (2012). Prematurity and twinning. *Journal of Maternal-Fetal and Neonatal Medicine, 25*(3), 6–10. doi: 10.3109/14767058.2012.712350

Gjerdingen, Dwenda; McGovern, Patricia; Attanasio, Laura; Johnson, Pamela Jo & Kozhimannil, Katy B. (2014). Maternal depressive symptoms, employment, and social support. *Journal of the American Board of Family Medicine*, *27*(1), 87–96. doi: 10.3122/jabfm.2014.01.130126

Glenberg, Arthur M.; Witt, Jessica K. & Metcalfe, Janet. (2013). From the revolution to embodiment: 25 years of cognitive psychology. *Perspectives on Psychological Science*, *8*(5), 573–585. doi: 10.1177/1745691613498098

Gluckman, Peter D. & Hanson, Mark A. (2006). *Developmental origins of health and disease*. New York, NY: Cambridge University Press.

Göbel, Silke M.; Shaki, Samuel & Fischer, Martin H. (2011). The cultural number line: A review of cultural and linguistic influences on the development of number processing. *Journal of Cross-Cultural Psychology*, *42*(4), 543–565. doi: 10.1177/0022022111406251

Goddings, Anne-Lise & Giedd, Jay N. (2014). Structural brain development during childhood and adolescence. In Michael S. Gazzaniga & George R. Mangun (Eds.), *The cognitive neurosciences* (5th ed., pp. 15–22). Cambridge, MA: The MIT Press.

Godinet, Meripa T.; Li, Fenfang & Berg, Teresa. (2014). Early childhood maltreatment and trajectories of behavioral problems: Exploring gender and racial differences. *Child Abuse & Neglect*, *38*(3), 544–556. doi: 10.1016/j.chiabu.2013.07.018

Godlike Productions. (2012). Lawns: Wasteful, unquestioned totems of conformity [Web log post]. Retrieved from http://www.godlikeproductions.com/forum1/message1925689/pg1

Goldfarb, Sally F. (2014). Who pays for the 'boomerang generation'?: A legal perspective on financial support for young adults. *Harvard Journal of Law and Gender*, *37*, 46–106.

Goldin-Meadow, Susan & Alibali, Martha W. (2013). Gesture's role in speaking, learning, and creating language. *Annual Review of Psychology*, *64*, 257–283. doi: 10.1146/annurev-psych-113011-143802

Goldstein, Michael H.; Schwade, Jennifer A. & Bornstein, Marc H. (2009). The value of vocalizing: Five-month-old infants associate their own noncry vocalizations with responses from caregivers. *Child Development*, *80*(3), 636–644. doi: 10.1111/j.1467-8624.2009.01287.x

Golinkoff, Roberta M. & Hirsh-Pasek, Kathy. (2008). How toddlers begin to learn verbs. *Trends in Cognitive Sciences*, *12*(10), 397–403. doi: 10.1016/j.tics.2008.07.003

Göncü, Artin & Gaskins, Suzanne. (2011). Comparing and extending Piaget's and Vygotsky's understandings of play: Symbolic play as individual, sociocultural, and educational interpretation. In Anthony D. Pellegrini (Ed.), *The Oxford handbook of the development of play* (pp. 48–57). New York, NY: Oxford University Press.

Gonzalez-Gomez, Nayeli; Hayashi, Akiko; Tsuji, Sho; Mazuka, Reiko & Nazzi, Thierry. (2014). The role of the input on the development of the LC bias: A crosslinguistic comparison. *Cognition*, *132*(3), 301–311. doi: 10.1016/j.cognition.2014.04.004

Goodlad, James K.; Marcus, David K. & Fulton, Jessica J. (2013). Lead and Attention-deficit/hyperactivity disorder (ADHD) symptoms: A meta-analysis. *Clinical Psychology Review*, *33*(3), 417–425. doi: 10.1016/j.cpr.2013.01.009

Goodman, Judith C.; Dale, Philip S. & Li, Ping. (2008). Does frequency count? Parental input and the acquisition of vocabulary. *Journal of Child Language*, *35*(3), 515–531. doi: 10.1017/S0305000907008641

Goodman, J. David. (2012, November 29). Photo of officer giving boots to barefoot man warms hearts online. *The New York Times*, p. A22.

Goodman, Sherryl H. & Gotlib, Ian H. (Eds.). (2002). *Children of depressed parents: Mechanisms of risk and implications for treatment*. Washington, DC: American Psychological Association.

Gopnik, Alison. (2001). Theories, language, and culture: Whorf without wincing. In Melissa Bowerman & Stephen C. Levinson (Eds.), *Language acquisition and conceptual development* (pp. 45–69). New York, NY: Cambridge University Press.

Gopnik, Alison. (2012). Scientific thinking in young children: Theoretical advances, empirical research, and policy implications. *Science*, *337*(6102), 1623–1627. doi: 10.1126/science.1223416

Gosso, Yumi. (2010). Play in different cultures. In Peter K. Smith (Ed.), *Children and play: Understanding children's worlds* (pp. 80–98). Malden, MA: Wiley-Blackwell.

Gottesman, Irving I.; Laursen, Thomas Munk; Bertelsen, Aksel & Mortensen, Preben Bo. (2010). Severe mental disorders in offspring with 2 psychiatrically ill parents. *Archives of General Psychiatry*, *67*(3), 252–257. doi: 10.1001/archgenpsychiatry.2010.1

Gottfried, Adele E.; Marcoulides, George A.; Gottfried, Allen W. & Oliver, Pamella H. (2009). A latent curve model of parental motivational practices and developmental decline in math and science academic intrinsic motivation. *Journal of Educational Psychology*, *101*(3), 729–739. doi: 10.1037/a0015084

Gottlieb, Alma. (2000). Luring your child into this life: A Beng path for infant care. In Judy S. DeLoache & Alma Gottlieb (Eds.), *A world of babies: Imagined childcare guides for seven societies* (pp. 55–90). New York, NY: Cambridge University Press.

Gough, Ethan K.; Moodie, Erica E. M.; Prendergast, Andrew J.; Johnson, Sarasa M. A.; Humphrey, Jean H.; Stoltzfus, Rebecca J., . . . Manges, Amee R. (2014). The impact of antibiotics on growth in children in low and middle income countries: Systematic review and meta-analysis of randomised controlled trials. *BMJ*, *348*, g2267. doi: 10.1136/bmj.g2267

Grady, Jessica S.; Ale, Chelsea M. & Morris, Tracy L. (2012). A naturalistic observation of social behaviours during preschool drop-off. *Early Child Development and Care*, *182*(12), 1683–1694. doi: 10.1080/03004430.2011.649266

Grady, Rosheen; Alavi, Nika; Vale, Rachel; Khandwala, Mohammad & McDonald, Sarah D. (2012). Elective single embryo transfer and perinatal outcomes: A systematic review and meta-analysis. *Fertility and Sterility*, *97*(2), 324–331. doi: 10.1016/j.fertnstert.2011.11.033

Graignic-Philippe, R.; Dayan, J.; Chokron, S.; Jacquet, A-Y. & Tordjman, S. (2014). Effects of prenatal stress on fetal and child development: A critical literature review. *Neuroscience & Biobehavioral Reviews*, *43*(5), 137–162. doi: 10.1016/j.neubiorev.2014.03.022

Grant, Kristen; Goldizen, Fiona C.; Sly, Peter D.; Brune, Marie-Noel; Neira, Maria; van den Berg, Martin & Norman, Rosana E. (2013). Health consequences of exposure to e-waste: A systematic review. *The Lancet Global Health*, *1*(6), e350–e361. doi: 10.1016/S2214-109X(13)70101-3

Grayson, David S.; Ray, Siddharth; Carpenter, Samuel; Iyer, Swathi; Dias, Taciana G. Costa; Stevens, Corinne, . . . Fair, Damien A. (2014). Structural and functional rich club organization of the brain in children and adults. *PLoS ONE*, *9*(2), e88297. doi: 10.1371/journal.pone.0088297

Green, James A.; Whitney, Pamela G. & Potegal, Michael. (2011). Screaming, yelling, whining, and crying: Categorical and intensity differences in vocal expressions of anger and sadness in children's tantrums. *Emotion*, *11*(5), 1124–1133. doi: 10.1037/a0024173

Greenough, William T.; Black, James E. & Wallace, Christopher S. (1987). Experience and brain development. *Child Development*, *58*(3), 539–559. doi: 10.1111/j.1467-8624.1987.tb01400.x

Greenough, William T. & Volkmar, Fred R. (1973). Pattern of dendritic branching in occipital cortex of rats reared in complex environments. *Experimental Neurology*, *40*(2), 491–504. doi: 10.1016/0014-4886(73)90090-3

Gregg, Christopher. (2010). Parental control over the brain. *Science*, *330*(6005), 770–771. doi: 10.1126/science.1199054

Gregg, Norman McAlister. (1941). Congenital cataract following German measles in the mother. *Transactions of the Ophthalmological Society of Australia*, *3*, 35–46.

Grobman, Kevin H. (2008). Learning & teaching developmental psychology: Attachment theory, infancy, & infant memory development. http://www.devpsy.org/questions/attachment_theory_memory.html

Gross, James J. (Ed.). (2014). *Handbook of emotion regulation* (2nd ed.). New York, NY: Guilford Press.

Grossmann, Klaus E.; Bretherton, Inge; Waters, Everett & Grossmann, Karin (Eds.). (2014). *Mary Ainsworth's enduring influence on attachment theory, research, and clinical applications*. New York, NY: Routledge.

Grossmann, Tobias. (2013). Mapping prefrontal cortex functions in human infancy. *Infancy, 18*(3), 303–324. doi: 10.1111/infa.12016

Grotevant, Harold D. & McDermott, Jennifer M. (2014). Adoption: Biological and social processes linked to adaptation. *Annual Review of Psychology, 65*, 235–265. doi: 10.1146/annurev-psych-010213-115020

Guerra, Nancy G. & Williams, Kirk R. (2010). Implementing bullying prevention in diverse settings: Geographic, economic, and cultural influences. In Eric M. Vernberg & Bridget K. Biggs (Eds.), *Preventing and treating bullying and victimization* (pp. 319–336). New York, NY: Oxford University Press.

Guerra, Nancy G.; Williams, Kirk R. & Sadek, Shelly. (2011). Understanding bullying and victimization during childhood and adolescence: A mixed methods study. *Child Development, 82*(1), 295–310. doi: 10.1111/j.1467-8624.2010.01556.x

Gummerum, Michaela; Keller, Monika; Takezawa, Masanori & Mata, Jutta. (2008). To give or not to give: Children's and adolescents' sharing and moral negotiations in economic decision situations. *Child Development, 79*(3), 562–576. doi: 10.1111/j.1467-8624.2008.01143.x

Guo, Sufang; Padmadas, Sabu S.; Zhao, Fengmin; Brown, James J. & Stones, R. William. (2007). Delivery settings and caesarean section rates in China. *Bulletin of the World Health Organization, 85*(10), 755–762. doi: 10.2471/BLT.06.035808

Gupta, Nidhi; Goel, Kashish; Shah, Priyali & Misra, Anoop. (2012). Childhood obesity in developing countries: Epidemiology, determinants, and prevention. *Endocrine Reviews, 33*(1), 48–70. doi: 10.1210/er.2010-0028

Haden, Catherine A. (2010). Talking about science in museums. *Child Development Perspectives, 4*(1), 62–67. doi: 10.1111/j.1750-8606.2009.00119.x

Haidt, Jonathan. (2013). *The righteous mind: Why good people are divided by politics and religion.* New York, NY: Vintage Books.

Hajek, Peter; Etter, Jean-François; Benowitz, Neal; Eissenberg, Thomas & McRobbie, Hayden. (2014). Electronic cigarettes: Review of use, content, safety, effects on smokers and potential for harm and benefit. *Addiction, 109*(11), 1801–1810. doi: 10.1111/add.12659

Halim, May Ling; Ruble, Diane N.; Tamis-LeMonda, Catherine S.; Zosuls, Kristina M.; Lurye, Leah E. & Greulich, Faith K. (2014). Pink frilly dresses and the avoidance of all things "girly": Children's appearance rigidity and cognitive theories of gender development. *Developmental Psychology*, 50(4), 1091–1101. doi: 10.1037/a0034906

Hall, Lynn K. (2008). *Counseling military families: What mental health professionals need to know.* New York, NY: Taylor & Francis.

Hallers-Haalboom, Elizabeth T.; Mesman, Judi; Groeneveld, Marleen G.; Endendijk, Joyce J.; van Berkel, Sheila R.; van der Pol, Lotte D. & Bakermans-Kranenburg, Marian J. (2014). Mothers, fathers, sons and daughters: Parental sensitivity in families with two children. *Journal of Family Psychology, 28*(2), 138–147. doi: 10.1037/a0036004

Hamerton, John L. & Evans, Jane A. (2005). Sex chromosome anomalies. In Merlin G. Butler & F. John Meaney (Eds.), *Genetics of developmental disabilities* (pp. 585–650). Boca Raton, FL: Taylor & Francis.

Hamilton, Alice. (1914). Lead poisoning in the United States. *American Journal of Public Health, 4*(6), 477–480. doi: 10.2105/AJPH.4.6.477-a

Hamlin, J. Kiley. (2014). The origins of human morality: Complex socio-moral evaluations by preverbal infants. In Jean Decety & Yves Christen (Eds.), *New frontiers in social neuroscience* (pp. 165–188). New York, NY: Springer. doi: 10.1007/978-3-319-02904-7_10

Hammond, Christopher J.; Andrew, Toby; Mak, Ying Tat & Spector, Tim D. (2004). A susceptibility locus for myopia in the normal population is linked to the PAX6 gene region on chromosome 11: A genomewide scan of dizygotic twins. *American Journal of Human Genetics, 75*(2), 294–304. doi: 10.1086/423148

Han, Euna; Norton, Edward C. & Powell, Lisa M. (2011). Direct and indirect effects of body weight on adult wages. *Economics & Human Biology, 9*(4), 381–392. doi: 10.1016/j.ehb.2011.07.002

Hanania, Riina. (2010). Two types of perseveration in the dimension change card sort task. *Journal of Experimental Child Psychology, 107*(3), 325–336. doi: 10.1016/j.jecp.2010.05.002

Hane, Amie Ashley; Cheah, Charissa; Rubin, Kenneth H. & Fox, Nathan A. (2008). The role of maternal behavior in the relation between shyness and social reticence in early childhood and social withdrawal in middle childhood. *Social Development, 17*(4), 795–811. doi: 10.1111/j.1467-9507.2008.00481.x

Hanks, Andrew S.; Just, David R. & Wansink, Brian. (2013). Smarter lunchrooms can address new school lunchroom guidelines and childhood obesity. *The Journal of Pediatrics, 162*(4), 867–869. doi: 10.1016/j.jpeds.2012.12.031

Hanson, Jamie L.; Nacewicz, Brendon M.; Sutterer, Matthew J.; Cayo, Amelia A.; Schaefer, Stacey M.; Rudolph, Karen D., . . . Davidson, Richard J. (2014). Behavioral problems after early life stress: Contributions of the hippocampus and amygdala. *Biological Psychiatry*, (In Press). doi: 10.1016/j.biopsych.2014.04.020

Hanushek, Eric A. & Woessmann, Ludger. (2009). Do better schools lead to more growth? Cognitive skills, economic outcomes, and causation. *Journal of Economic Growth, 17*(4), 267–321. doi: 10.1007/s10887-012-9081-x

Hanushek, Eric A. & Wößmann, Ludger. (2007). *The role of education quality in economic growth.* Washington, DC: World Bank, *World Bank Policy Research Working Paper No. 4122.*

Hare, Kelly M. & Cree, Alison. (2010). Incidence, causes and consequences of pregnancy failure in viviparous lizards: Implications for research and conservation settings. *Reproduction, Fertility and Development, 22*(5), 761–770. doi: 10.1071/RD09195

Harjes, Carlos E.; Rocheford, Torbert R.; Bai, Ling; Brutnell, Thomas P.; Kandianis, Catherine Bermudez; Sowinski, Stephen G., . . . Buckler, Edward S. (2008). Natural genetic variation in lycopene epsilon cyclase tapped for maize biofortification. *Science, 319*(5861), 330–333. doi: 10.1126/science.1150255

Harkness, Sara; Super, Charles M. & Mavridis, Caroline J. (2011). Parental ethnotheories about children's socioemotional development. In Xinyin Chen & Kenneth H. Rubin (Eds.), *Socioemotional development in cultural context* (pp. 73–98). New York, NY: Guilford Press.

Harlor, Allen D. Buz & Bower, Charles. (2009). Hearing assessment in infants and children: Recommendations beyond neonatal screening. *Pediatrics, 124*(4), 1252–1263. doi: 10.1542/peds.2009-1997

Harris, Judith R. (1998). *The nurture assumption: Why children turn out the way they do.* New York, NY: Free Press.

Harris, Judith R. (2002). Beyond the nurture assumption: Testing hypotheses about the child's environment. In John G. Borkowski, et al. (Eds.), *Parenting and the child's world: Influences on academic, intellectual, and social-emotional development* (pp. 3–20). Mahwah, NJ: Erlbaum.

Harrison, Denise; Bueno, Mariana; Yamada, Janet; Adams-Webber, Thomasin & Stevens, Bonnie. (2010). Analgesic effects of sweet-tasting solutions for infants: Current state of equipoise. *Pediatrics, 126*(5), 894–902. doi: 10.1542/peds.2010-1593

Harrison, Kristen; Bost, Kelly K.; McBride, Brent A.; Donovan, Sharon M.; Grigsby-Toussaint, Diana S.; Kim, Juhee, . . . Jacobsohn, Gwen Costa. (2011). Toward a developmental conceptualization of contributors to overweight and obesity in childhood: The Six-Cs model. *Child Development Perspectives, 5*(1), 50–58. doi: 10.1111/j.1750-8606.2010.00150.x

Harrison, Linda J.; Elwick, Sheena; Vallotton, Claire D. & Kappler, Gregor. (2014). Spending time with others: A time-use diary for infant-toddler child care. In Linda J. Harrison & Jennifer Sumsion (Eds.), *Lived spaces of infant-toddler education and care: Exploring diverse perspectives on theory, research and practice* (pp. 59–74). Dordrecht, Netherlands: Springer. doi: 10.1007/978-94-017-8838-0_5

Harrist, Amanda W.; Topham, Glade L.; Hubbs-Tait, Laura; Page, Melanie C.; Kennedy, Tay S. & Shriver, Lenka H. (2012). What developmental science can contribute to a transdisciplinary understanding of childhood obesity: An interpersonal and intrapersonal risk model. *Child Development Perspectives, 6*(4), 445–455. doi: 10.1111/cdep.12004

Hart, Betty & Risley, Todd R. (1995). *Meaningful differences in the everyday experience of young American children.* Baltimore, MD: P.H. Brookes

Hart, Chantelle N.; Cairns, Alyssa & Jelalian, Elissa. (2011). Sleep and obesity in children and adolescents. *Pediatric Clinics of North America*, 58(3), 715–733. doi: 10.1016/j.pcl.2011.03.007

Harter, Susan. (2012). *The construction of the self: Developmental and sociocultural foundations* (2nd ed.). New York, NY: Guilford Press.

Hatch, J. Amos. (2012). From theory to curriculum: Developmental theory and its relationship to curriculum and instruction in early childhood education. In Nancy File, et al. (Eds.), *Curriculum in early childhood education: Re-examined, rediscovered, renewed*. New York, NY: Routledge.

Hatzenbuehler, Mark L. (2014). Structural stigma and the health of lesbian, gay, and bisexual populations. *Current Directions in Psychological Science*, 23(2), 127–132. doi: 10.1177/0963721414523775

Hawthorne, Joanna. (2009). Promoting development of the early parent-infant relationship using the Neonatal Behavioural Assessment Scale. In Jane Barlow & P. O. Svanberg (Eds.), *Keeping the baby in mind: Infant mental health in practice* (pp. 39–51). New York, NY: Routledge.

Hayden, Ceara; Bowler, Jennifer O.; Chambers, Stephanie; Freeman, Ruth; Humphris, Gerald; Richards, Derek & Cecil, Joanne E. (2013). Obesity and dental caries in children: A systematic review and meta-analysis. *Community Dentistry and Oral Epidemiology*, *41*(4), 289–308. doi: 10.1111/cdoe.12014

Hayden, Elizabeth P. & Mash, Eric J. (2014). Child psychopathology: A developmental-systems perspective. In Eric J. Mash & Russell A. Barkley (Eds.), *Child psychopathology* (3rd ed., pp. 3–72). New York, NY: Guilford Press.

Haydon, Jo. (2007). *Genetics in practice: A clinical approach for healthcare practitioners*. Hoboken, NJ: Wiley.

Hayes, Rachel A. & Slater, Alan. (2008). Three-month-olds' detection of alliteration in syllables. *Infant Behavior and Development*, *31*(1), 153–156. doi: 10.1016/j.infbeh.2007.07.009

Hayne, Harlene & Simcock, Gabrielle. (2009). Memory development in toddlers. In Mary L. Courage & Nelson Cowan (Eds.), *The development of memory in infancy and childhood* (2nd ed., pp. 43–68). New York, NY: Psychology Press.

Hayslip, Bert; Blumenthal, Heidemarie & Garner, Ashley. (2014). Health and grandparent–grandchild well-being: One-year longitudinal findings for custodial grandfamilies. *Journal of Aging and Health*, *26*(4), 559–582. doi: 10.1177/0898264314525664

Hayslip, Bert & Smith, Gregory C. (Eds.). (2013). *Resilient grandparent caregivers: A strengths-based perspective*. New York, NY: Routledge.

Heaton, Tim B. & Darkwah, Akosua. (2011). Religious differences in modernization of the family: Family demographics trends in Ghana. *Journal of Family Issues*, 32(12), 1576–1596. doi: 10.1177/0192513x11398951

Hein, Sascha; Tan, Mei; Aljughaiman, Abdullah & Grigorenko, Elena L. (2014). Characteristics of the home context for the nurturing of gifted children in Saudi Arabia. *High Ability Studies*, 25(1), 23–33. doi: 10.1080/13598139.2014.906970

Hemminki, Kari; Sundquist, Jan & Bermejo, Justo L. (2008). Familial risks for cancer as the basis for evidence based clinical referral and counseling. *The Oncologist*, *13*(3), 239–247. doi: 10.1634/theoncologist.2007-0242

Henry, P. J. (2011). The role of stigma in understanding ethnicity differences in authoritarianism. *Political Psychology*, 32(3), 419–438. doi: 10.1111/j.1467-9221.2010.00816.x

Herek, Gregory M. (2010). Sexual orientation differences as deficits: Science and stigma in the history of American psychology. *Perspectives on Psychological Science*, 5(6), 693–699. doi: 10.1177/1745691610388770

Herman, Khalisa N.; Paukner, Annika & Suomi, Stephen J. (2011). Gene × environment interactions and social play: Contributions from rhesus macaques. In Anthony D. Pellegrini (Ed.), *The Oxford handbook of the development of play* (pp. 58–69). New York, NY: Oxford University Press. doi: 10.1093/oxfordhb/9780195393002.013.0006

Herrmann, Esther; Call, Josep; Hernàndez-Lloreda, María Victoria; Hare, Brian & Tomasello, Michael. (2007). Humans have evolved specialized skills of social cognition: The cultural intelligence hypothesis. *Science*, *317*(5843), 1360 1366. doi: 10.1126/science.1146282

Herschensohn, Julia R. (2007). *Language development and age*. New York, NY: Cambridge University Press.

Hetherington, E. Mavis. (2006). The influence of conflict, marital problem solving and parenting on children's adjustment in nondivorced, divorced and remarried families. In Alison Clarke-Stewart & Judy Dunn (Eds.), *Families count: Effects on child and adolescent development* (pp. 203–237). New York, NY: Cambridge University Press.

Hewer, Mariko. (2014). Selling sweet nothings: Science shows food marketing's effects on children's minds—and appetites. *Observer*, *27*(10).

Hines, Melissa. (2013). Sex and sex differences. In Philip D. Zelazo (Ed.), *The Oxford handbook of developmental psychology* (Vol. 1, pp. 162–201). New York, NY: Oxford University Press. doi: 10.1093/oxfordhb/9780199958450.013.0007

Hinnant, J. Benjamin; Nelson, Jackie A.; O'Brien, Marion; Keane, Susan P. & Calkins, Susan D. (2013). The interactive roles of parenting, emotion regulation and executive functioning in moral reasoning during middle childhood. *Cognition and Emotion*, *27*(8), 1460–1468. doi: 10.1080/02699931.2013.789792

Hirvonen, Riikka; Aunola, Kaisa; Alatupa, Saija; Viljaranta, Jaana & Nurmi, Jari-Erik. (2013). The role of temperament in children's affective and behavioral responses in achievement situations. *Learning and Instruction*, *27*, 21–30. doi: 10.1016/j.learninstruc.2013.02.005

Ho, Emily S. (2010). Measuring hand function in the young child. *Journal of Hand Therapy*, *23*(3), 323–328. doi: 10.1016/j.jht.2009.11.002

Hoeve, Machteld; Dubas, Judith S.; Gerris, Jan R. M.; van der Laan, Peter H. & Smeenk, Wilma. (2011). Maternal and paternal parenting styles: Unique and combined links to adolescent and early adult delinquency. *Journal of Adolescence*, *34*(5), 813–827. doi: 10.1016/j.adolescence.2011.02.004

Hoff, Erika. (2013). Interpreting the early language trajectories of children from low-SES and language minority homes: Implications for closing achievement gaps. *Developmental Psychology*, *49*(1), 4–14. doi: 10.1037/a0027238

Hoff, Erika; Core, Cynthia; Place, Silvia; Rumiche, Rosario; Señor, Melissa & Parra, Marisol. (2012). Dual language exposure and early bilingual development. *Journal of Child Language*, *39*(1), 1–27. doi: 10.1017/S0305000910000759

Hoff, Erika; Rumiche, Rosario; Burridge, Andrea; Ribota, Krystal M. & Welsh, Stephanie N. (2014). Expressive vocabulary development in children from bilingual and monolingual homes: A longitudinal study from two to four years. *Early Childhood Research Quarterly*, *29*(4), 433–444. doi: 10.1016/j.ecresq.2014.04.012

Hoffman, Jessica L.; Teale, William H. & Paciga, Kathleen A. (2013). Assessing vocabulary learning in early childhood. *Journal of Early Childhood Literacy*. doi: 10.1177/1468798413501184

Holden, Constance. (2009). Fetal cells again? *Science*, *326*(5951), 358–359. doi: 10.1126/science.326_358

Holden, Constance. (2010). Myopia out of control. *Science*, *327*(5961), 17. doi: 10.1126/science.327.5961.17-c

Hollich, George J.; Hirsh-Pasek, Kathy; Golinkoff, Roberta M.; Brand, Rebecca J.; Brown, Ellie; Chung, He Len, . . . Rocroi, Camille. (2000). *Breaking the language barrier: An emergentist coalition model for the origins of word learning*. Malden, MA: Blackwell.

Holmboe, K.; Nemoda, Z.; Fearon, R. M. P.; Sasvari-Szekely, M. & Johnson, M. H. (2011). Dopamine D4 receptor and serotonin transporter gene effects on the longitudinal development of infant temperament. *Genes, Brain and Behavior*, *10*(5), 513–522. doi: 10.1111/j.1601-183X.2010.00669.x

Holsti, Liisa; Grunau, Ruth E. & Shany, Eilon. (2011). Assessing pain in preterm infants in the neonatal intensive care unit: Moving to a brain-oriented approach. *Pain Management*, *1*(2), 171–179. doi: 10.2217/pmt.10.19

Holtzman, Jennifer. (2009). Simple, effective--and inexpensive--strategies to reduce tooth decay in children. *ICAN: Infant, Child, & Adolescent Nutrition*, *1*(4), 225–231. doi: 10.1177/1941406409338861

Hong, David S. & Reiss, Allan L. (2014). Cognitive and neurological aspects of sex chromosome aneuploidies. *The Lancet Neurology*, *13*(3), 306–318. doi: 10.1016/S1474-4422(13)70302-8

Hong, Jun Sung; Algood, Carl L.; Chiu, Yu-Ling & Lee, Stephanie Ai-Ping. (2011). An ecological understanding of kinship foster care

in the United States. *Journal of Child and Family Studies, 20*(6), 863–872. doi: 10.1007/s10826-011-9454-3

Hong, Jun Sung & Garbarino, James. (2012). Risk and protective factors for homophobic bullying in schools: An application of the social–ecological framework. *Educational Psychology Review, 24*(2), 271–285. doi: 10.1007/s10648-012-9194-y

Hong, Soo-Young; Torquati, Julia & Molfese, Victoria J. (2013). Theory guided professional development in early childhood science education. In Lynn E. Cohen & Sandra Waite-Stupiansky (Eds.), *Learning across the early childhood curriculum* (pp. 1–32). Bingley, UK: Emerald.

Hook, Jennifer L. (2010). Gender inequality in the welfare state: Sex segregation in housework, 1965–2003. *American Journal of Sociology, 115*(5), 1480–1523. doi: 10.1086/651384

Hopkins, J. Roy. (2011). The enduring influence of Jean Piaget. *Observer, 24*(10).

Horowitz, Alice M.; Kleinman, Dushanka V. & Wang, Min Qi. (2013). What Maryland adults with young children know and do about preventing dental caries. *American Journal of Public Health, 103*(6), e69–e76. doi: 10.2105/AJPH.2012.301038

Horton, Megan K.; Kahn, Linda G.; Perera, Frederica; Barr, Dana B. & Rauh, Virginia. (2012). Does the home environment and the sex of the child modify the adverse effects of prenatal exposure to chlorpyrifos on child working memory? *Neurotoxicology and Teratology, 34*(5), 534–541. doi: 10.1016/j.ntt.2012.07.004

Horwitz, Ralph I.; Cullen, Mark R.; Abell, Jill & Christian, Jennifer B. (2013). (De) Personalized medicine. *Science, 339*(6124), 1155–1156. doi: 10.1126/science.1234106

Hougaard, Karin S. & Hansen, Åse M. (2007). Enhancement of developmental toxicity effects of chemicals by gestational stress: A review. *Neurotoxicology and Teratology, 29*(4), 425–445. doi: 10.1016/j.ntt.2007.02.003

Howard, Elizabeth R.; Páez, Mariela M.; August, Diane L.; Barr, Christopher D.; Kenyon, Dorry & Malabonga, Valerie. (2014). The importance of SES, home and school language and literacy practices, and oral vocabulary in bilingual children's English reading development. *Bilingual Research Journal, 37*(2), 120–141. doi: 10.1080/15235882.2014.934485

Howell, Diane M.; Wysocki, Karen & Steiner, Michael J. (2010). Toilet training. *Pediatrics In Review, 31*(6), 262–263. doi: 10.1542/pir.31-6-262

Hoyert, Donna L.; Kochanek, Kenneth D. & Murphy, Sherry L. (1999). *Deaths: Final data for 1997*. Hyattsville, MD: National Center for Health Statistics, *47*(19).

Hoyert, Donna L.; Kung, Hsiang-Ching & Smith, Betty L. (2005). *Deaths: Preliminary data for 2003*. Hyattsville, MD: National Center for Health Statistics, *53*(15).

Hoyert, Donna L. & Xu, Jiaquan. (2012). *Deaths: Preliminary data for 2011*. Hyattsville, MD: National Center for Health Statistics, *61*(6).

Hrdy, Sarah B. (2009). *Mothers and others: The evolutionary origins of mutual understanding*. Cambridge, MA: Harvard University Press.

Hsia, Yingfen & Maclennan, Karyn. (2009). Rise in psychotropic drug prescribing in children and adolescents during 1992–2001: A population-based study in the UK. *European Journal of Epidemiology, 24*(4), 211–216. doi: 10.1007/s10654-009-9321-3

Huang, Chien-Chung. (2009). Mothers' reports of nonresident fathers' involvement with their children: Revisiting the relationship between child support payment and visitation. *Family Relations, 58*(1), 54–64. doi: 10.1111/j.1741-3729.2008.00534.x

Hugdahl, Kenneth & Westerhausen, René (Eds.). (2010). *The two halves of the brain: Information processing in the cerebral hemispheres*. Cambridge, MA: The MIT Press.

Hughey, Matthew W. & Parks, Gregory. (2014). *The wrongs of the right: Language, race, and the Republican Party in the age of Obama*. New York, NY: New York University Press.

Huh, Susanna Y.; Rifas-Shiman, Sheryl L.; Taveras, Elsie M.; Oken, Emily & Gillman, Matthew W. (2011). Timing of solid food introduction and risk of obesity in preschool-aged children. *Pediatrics, 127*(3), e544–e551. doi: 10.1542/peds.2010-0740

Huh, Susanna Y.; Rifas-Shiman, Sheryl L.; Zera, Chloe A.; Edwards, Janet W. Rich; Oken, Emily; Weiss, Scott T. & Gillman, Matthew W. (2012). Delivery by caesarean section and risk of obesity in preschool age children: A prospective cohort study. *Archives of the Diseases of Childhood, 97*(7), 610–616. doi: 10.1136/archdischild-2011-301141

Hultman, C. M.; Sandin, S.; Levine, S. Z.; Lichtenstein, P. & Reichenberg, A. (2011). Advancing paternal age and risk of autism: New evidence from a population-based study and a meta-analysis of epidemiological studies. *Molecular Psychiatry, 16*(12), 1203–1212. doi: 10.1038/mp.2010.121

Huntsinger, Carol S.; Jose, Paul E.; Krieg, Dana B. & Luo, Zupei. (2011). Cultural differences in Chinese American and European American children's drawing skills over time. *Early Childhood Research Quarterly, 26*(1), 134–145. doi: 10.1016/j.ecresq.2010.04.002

Huston, Aletha C. & Ripke, Marika N. (2006). Middle childhood: Contexts of development. In Aletha C. Huston & Marika N. Ripke (Eds.), *Developmental contexts in middle childhood. Bridges to adolescence and adulthood* (pp. 1–22). New York, NY: Cambridge University Press.

Hutchinson, Esther A.; De Luca, Cinzia R.; Doyle, Lex W.; Roberts, Gehan & Anderson, Peter J. (2013). School-age outcomes of extremely preterm or extremely low birth weight children. *Pediatrics, 131*(4), e1053–e1061. doi: 10.1542/peds.2012-2311

Huver, Rose M. E.; Otten, Roy; de Vries, Hein & Engels, Rutger C. M. E. (2010). Personality and parenting style in parents of adolescents. *Journal of Adolescence, 33*(3), 395–402. doi: 10.1016/j.adolescence.2009.07.012

Huynh, Jimmy L. & Casaccia, Patrizia. (2013). Epigenetic mechanisms in multiple sclerosis: Implications for pathogenesis and treatment. *The Lancet Neurology, 12*(2), 195–206. doi: 10.1016/S1474-4422(12)70309-5

Hyde, Janet S. (2014). Gender similarities and differences. *Annual Review of Psychology, 65*, 373–398. doi: 10.1146/annurev-psych-010213-115057

Hyde, Janet S.; Lindberg, Sara M.; Linn, Marcia C.; Ellis, Amy B. & Williams, Caroline C. (2008). Gender similarities characterize math performance. *Science, 321*(5888), 494–495. doi: 10.1126/science.1160364

Iacovidou, Nicoletta; Varsami, Marianna & Syggellou, Angeliki. (2010). Neonatal outcome of preterm delivery. *Annals of the New York Academy of Sciences, 1205*, 130–134. doi: 10.1111/j.1749-6632.2010.05657.x

Iida, Hiroko & Rozier, R. Gary. (2013). Mother-Perceived social capital and children's oral health and use of dental care in the United States. *American Journal of Public Health, 103*(3), 480–487. doi: 10.2105/AJPH.2012.300845

Ikeda, Martin J. (2012). Policy and practice considerations for response to intervention: Reflections and commentary. *Journal of Learning Disabilities, 45*(3), 274–277. doi: 10.1177/0022219412442170

ILO. (2011). Database of conditions of work and employment laws. from International Labour Organization http://www.ilo.org/dyn/travail/travmain.home

Imai, Mutsumi; Kita, Sotaro; Nagumo, Miho & Okada, Hiroyuki. (2008). Sound symbolism facilitates early verb learning. *Cognition, 109*(1), 54–65. doi: 10.1016/j.cognition.2008.07.015

Inan, Hatice Z.; Trundle, Kathy C. & Kantor, Rebecca. (2010). Understanding natural sciences education in a Reggio Emilia-inspired preschool. *Journal of Research in Science Teaching, 47*(10), 1186–1208. doi: 10.1002/tea.20375

Inhelder, Bärbel & Piaget, Jean. (1958). *The growth of logical thinking from childhood to adolescence: An essay on the construction of formal operational structures*. New York, NY: Basic Books.

Inhelder, Bärbel & Piaget, Jean. (1964). *The early growth of logic in the child: Classification and seriation*. New York, NY: Harper & Row.

Inhelder, Bärbel & Piaget, Jean. (2013a). *The early growth of logic in the child: Classification and seriation*. New York, NY: Routledge.

Inhelder, Bärbel & Piaget, Jean. (2013b). *The growth of logical thinking from childhood to adolescence: An essay on the construction of formal operational structures*. New York, NY: Routledge.

Insel, Thomas R. (2014). Mental disorders in childhood: Shifting the focus from behavioral symptoms to neurodevelopmental trajectories. *JAMA, 311*(17), 1727–1728. doi: 10.1001/jama.2014.1193

Institute of Medicine (U.S.). Immunization Safety Review Committee. (2004). *Immunization*

safety review: Vaccines and autism. Washington, DC: National Academies Press.

Irwin, Scott; Galvez, Roberto; Weiler, Ivan Jeanne; Beckel-Mitchener, Andrea & Greenough, William. (2002). Brain structure and the functions of FMR1 protein. In Randi Jenssen Hagerman & Paul J. Hagerman (Eds.), *Fragile X syndrome: Diagnosis, treatment, and research* (3rd ed., pp. 191–205). Baltimore, MD: Johns Hopkins University Press.

Ishii, Nozomi; Kono, Yumi; Yonemoto, Naohiro; Kusuda, Satoshi & Fujimura, Masanori. (2013). Outcomes of infants born at 22 and 23 weeks' gestation. *Pediatrics, 132*(1), 62–71. doi: 10.1542/peds.2012-2857

Ispa, Jean M.; Fine, Mark A.; Halgunseth, Linda C.; Harper, Scott; Robinson, JoAnn; Boyce, Lisa, . . . Brady-Smith, Christy. (2004). Maternal intrusiveness, maternal warmth, and mother-toddler relationship outcomes: Variations across low-income ethnic and acculturation groups. *Child Development, 75*(6), 1613–1631. doi: 10.1111/j.1467-8624.2004.00806.x

Ivcevic, Zorana & Brackett, Marc. (2014). Predicting school success: Comparing conscientiousness, grit, and emotion regulation ability. *Journal of Research in Personality, 52*, 29–36. doi: 10.1016/j.jrp.2014.06.005

Izard, Carroll E. (2009). Emotion theory and research: Highlights, unanswered questions, and emerging issues. *Annual Review of Psychology, 60*, 1–25. doi: 10.1146/annurev.psych.60.110707.163539

Jaffe, Arthur C. (2011). Failure to thrive: Current clinical concepts. *Pediatrics In Review, 32*(3), 100–108. doi: 10.1542/pir.32-3-100

Jaffe, Eric. (2004). Mickey Mantle's greatest error: Yankee star's false belief may have cost him years. *Observer, 17*(9), 37.

Jaffee, Sara R.; Caspi, Avshalom; Moffitt, Terrie E.; Polo-Tomás, Monica & Taylor, Alan. (2007). Individual, family, and neighborhood factors distinguish resilient from non-resilient maltreated children: A cumulative stressors model. *Child Abuse & Neglect, 31*(3), 231–253. doi: 10.1016/j.chiabu.2006.03.011

Jambon, Marc & Smetana, Judith G. (2014). Moral complexity in middle childhood: Children's evaluations of necessary harm. *Developmental Psychology, 50*(1), 22–33. doi: 10.1037/a0032992

Jansen, Jarno; Beijers, Roseriet; Riksen-Walraven, Marianne & de Weerth, Carolina. (2010). Cortisol reactivity in young infants. *Psychoneuroendocrinology, 35*(3), 329–338. doi: 10.1016/j.psyneuen.2009.07.008

Jarcho, Johanna M.; Fox, Nathan A.; Pine, Daniel S.; Etkin, Amit; Leibenluft, Ellen; Shechner, Tomer & Ernst, Monique. (2013). The neural correlates of emotion-based cognitive control in adults with early childhood behavioral inhibition. *Biological Psychology, 92*(2), 306–314. doi: 10.1016/j.biopsycho.2012.09.008

Jasny, Barbara R.; Chin, Gilbert; Chong, Lisa & Vignieri, Sacha. (2011). Again, and again, and again... *Science, 334*(6060), 1225. doi: 10.1126/science.334.6060.1225

Jednoróg, Katarzyna; Altarelli, Irene; Monzalvo, Karla; Fluss, Joel; Dubois, Jessica; Billard, Catherine, . . . Ramus, Franck. (2012). The influence of socioeconomic status on children's brain structure. *PLoS ONE, 7*(8), e42486. doi: 10.1371/journal.pone.0042486

Ji, Cheng Ye; Chen, Tian Jiao & Working Group on Obesity in China (WGOC). (2013). Empirical changes in the prevalence of overweight and obesity among Chinese students from 1985 to 2010 and corresponding preventive strategies. *Biomedical and Environmental Sciences, 26*(1), 1–12. doi: 10.3967/0895_3988.2013.01.001

Johnson, Elizabeth K. & Tyler, Michael D. (2010). Testing the limits of statistical learning for word segmentation. *Developmental Science, 13*(2), 339–345. doi: 10.1111/j.1467-7687.2009.00886.x

Johnson, Mark H. (2011). *Developmental cognitive neuroscience: An introduction* (3rd ed.) Malden, MA: Wiley-Blackwell.

Johnson, Mark H. & Fearon, R. M. Pasco. (2011). Commentary: Disengaging the infant mind: Genetic dissociation of attention and cognitive skills in infants –Reflections on Leppänen et al. (2011). *Journal of Child Psychology and Psychiatry, 52*(11), 1153–1154. doi: 10.1111/j.1469-7610.2011.02433.x

Johnson, Susan C.; Dweck, Carol S.; Chen, Frances S.; Stern, Hilarie L.; Ok, Su-Jeong & Barth, Maria. (2010). At the intersection of social and cognitive development: Internal working models of attachment in infancy. *Cognitive Science, 34*(5), 807–825. doi: 10.1111/j.1551-6709.2010.01112.x

Johnson, Teddi D. (2011). Report calls for examination of chemical safety: National coalition notes difficulty determining exposures. *The Nation's Health, 41*(6), 9.

Johnston, Lloyd D.; O'Malley, Patrick M.; Bachman, Jerald G.; Schulenberg, John E. & Miech, Richard A. (2014). *Monitoring the future, national survey results on drug use, 1975–2013: Volume 1, Secondary school students*. Ann Arbor, MI: Institute for Social Research, The University of Michigan.

Jones, Andrea M. & Morris, Tracy L. (2012). Psychological adjustment of children in foster care: Review and implications for best practice. *Journal of Public Child Welfare, 6*(2), 129–148. doi: 10.1080/15548732.2011.617272

Jong, Jyh-Tsorng; Kao, Tsair; Lee, Liang-Yi; Huang, Hung-Hsuan; Lo, Po-Tsung & Wang, Hui-Chung. (2010). Can temperament be understood at birth? The relationship between neonatal pain cry and their temperament: A preliminary study. *Infant Behavior and Development, 33*(3), 266–272. doi: 10.1016/j.infbeh.2010.02.001

Jonsson, Maria; Cnattingius, Sven & Wikström, Anna-Karin. (2013). Elective induction of labor and the risk of cesarean section in low-risk parous women: A cohort study. *Acta Obstetricia et Gynecologica Scandinavica, 92*(2), 198–203. doi: 10.1111/aogs.12043

Juan, Shan. (2010, January 14). C-section epidemic hits China: WHO. *China Daily*.

Julian, Megan M. (2013). Age at adoption from institutional care as a window into the lasting effects of early experiences. *Clinical Child and Family Psychology Review, 16*(2), 101–145. doi: 10.1007/s10567-013-0130-6

Jung, Rex E. & Ryman, Sephira G. (2013). Imaging creativity. In Kyung Hee Kim, et al. (Eds.), *Creatively gifted students are not like other gifted students: Research, theory, and practice* (pp. 69–87). Rotterdam, The Netherlands: SensePublishers. doi: 10.1007/978-94-6209-149-8_6

Juvonen, Jaana & Graham, Sandra. (2014). Bullying in schools: The power of bullies and the plight of victims. *Annual Review of Psychology, 65*, 159–185. doi: 10.1146/annurev-psych-010213-115030

Kachel, A. Friederike; Premo, Luke S. & Hublin, Jean-Jacques. (2011). Modeling the effects of weaning age on length of female reproductive period. Implications for the evolution of human life history. *American Journal of Human Biology, 23*(4), 479–487. doi: 10.1002/ajhb.21157

Kagan, Jerome. (2011). Three lessons learned. *Perspectives on Psychological Science, 6*(2), 107–113. doi: 10.1177/1745691611400205

Kahana-Kalman, Ronit & Walker-Andrews, Arlene S. (2001). The role of person familiarity in young infants' perception of emotional expressions. *Child Development, 72*(2), 352–369. doi: 10.1111/1467-8624.00283

Kaiser, Jocelyn. (2013). Researchers to explore promise, risks of sequencing newborns' DNA. *Science, 341*(6151), 1163. doi: 10.1126/science.341.6151.1163

Kaiser, Jocelyn. (2014). Gearing up for a closer look at the human placenta. *Science, 344*(6188), 1073. doi: 10.1126/science.344.6188.1073

Kalil, Ariel; Ryan, Rebecca & Chor, Elise. (2014). Time investments in children across family structures. *The ANNALS of the American Academy of Political and Social Science, 654*(1), 150–168. doi: 10.1177/0002716214528276

Kalliala, Marjatta. (2006). *Play culture in a changing world*. Maidenhead, UK: Open University Press.

Kandel, Denise B. (Ed.). (2002). *Stages and pathways of drug involvement: Examining the gateway hypothesis*. New York, NY: Cambridge University Press.

Kang, Hye-Kyung. (2014). Influence of culture and community perceptions on birth and perinatal care of immigrant women: Doulas' perspective. *The Journal of Perinatal Education, 23*(1), 25–32. doi: 10.1891/1058-1243.23.1.25

Kanner, Leo. (1943). Autistic disturbances of affective contact. *Nervous Child, 2*, 217–250.

Kanny, Mary A.; Sax, Linda J. & Riggers-Piehl, Tiffani A. (2014). Investigating forty years of STEM research: How explanations for the gender gap have evolved over time. *Journal of Women and Minorities in Science and*

Engineering, *20*(2), 127–148. doi: 10.1615/JWomenMinorScienEng.2014007246

Kapp, Steven K.; Gillespie-Lynch, Kristen; Sherman, Lauren E. & Hutman, Ted. (2013). Deficit, difference, or both? Autism and neurodiversity. *Developmental Psychology*, *49*(1), 59–71. doi: 10.1037/a0028353

Karama, Sherif; Ad-Dab'bagh, Yasser; Haier, Richard J.; Deary, Ian J.; Lyttelton, Oliver C.; Lepage, Claude & Evans, Alan C. (2009). Positive association between cognitive ability and cortical thickness in a representative US sample of healthy 6 to 18-year-olds. *Intelligence*, *37*(2), 145–155. doi: 10.1016/j.intell.2008.09.006

Kärnä, Antti; Voeten, Marinus; Little, Todd D.; Poskiparta, Elisa; Kaljonen, Anne & Salmivalli, Christina. (2011). A large-scale evaluation of the KiVa antibullying program: Grades 4–6. *Child Development*, *82*(1), 311–330. doi: 10.1111/j.1467-8624.2010.01557.x

Kärtner, Joscha; Borke, Jörn; Maasmeier, Kathrin; Keller, Heidi & Kleis, Astrid. (2011). Sociocultural influences on the development of self-recognition and self-regulation in Costa Rican and Mexican toddlers. *Journal of Cognitive Education and Psychology*, *10*(1), 96–112. doi: 10.1891/1945-8959.10.1.96

Kärtner, Joscha; Keller, Heidi & Yovsi, Relindis D. (2010). Mother–infant interaction during the first 3 months: The emergence of culture-specific contingency patterns. *Child Development*, *81*(2), 540–554. doi: 10.1111/j.1467-8624.2009.01414.x

Kastenbaum, Robert J. (2012). *Death, society, and human experience* (11th ed.). Boston, MA: Pearson.

Kavanaugh, Robert D. (2011). Origins and consequences of social pretend play. In Anthony D. Pellegrini (Ed.), *The Oxford handbook of the development of play* (pp. 296–307). New York, NY: Oxford University Press. doi: 10.1093/oxfordhb/9780195393002.013.0022

Keil, Frank C. (2011). Science starts early. *Science*, *331*(6020), 1022–1023. doi: 10.1126/science.1195221

Keller, Heidi. (2014). Introduction Understanding relationships. In Hiltrud Otto & Heidi Keller (Eds.), *Different faces of attachment: Cultural variations on a universal human need* (pp. 3–25). New York, NY: Cambridge University Press.

Keller, Heidi; Borke, Jörn; Chaudhary, Nandita; Lamm, Bettina & Kleis, Astrid. (2010). Continuity in parenting strategies: A cross-cultural comparison. *Journal of Cross-Cultural Psychology*, *41*(3), 391–409. doi: 10.1177/0022022109359690

Keller, Heidi & Otto, Hiltrud. (2011). Different faces of autonomy. In Xinyin Chen & Kenneth H. Rubin (Eds.), *Socioemotional development in cultural context* (pp. 164–185). New York, NY: Guilford Press.

Keller, Heidi; Yovsi, Relindis; Borke, Joern; Kärtner, Joscha; Jensen, Henning & Papaligoura, Zaira. (2004). Developmental consequences of early parenting experiences: Self-recognition and self-regulation in three cultural communities. *Child Development*, *75*(6), 1745–1760. doi: 10.1111/j.1467-8624.2004.00814.x

Kellman, Philip J. & Arterberry, Martha E. (2006). Infant visual perception. In William Damon & Richard M. Lerner (Eds.), *Handbook of child psychology* (6th ed., Vol. 2, pp. 109–160). Hoboken, NJ: Wiley.

Kelly, Daniel; Faucher, Luc & Machery, Edouard. (2010). Getting rid of racism: Assessing three proposals in light of psychological evidence. *Journal of Social Philosophy*, *41*(3), 293–322. doi: 10.1111/j.1467-9833.2010.01495.x

Kempe, Ruth S. & Kempe, C. Henry. (1978). *Child abuse*. Cambridge, MA: Harvard University Press.

Kendall-Taylor, Nathaniel; Lindland, Eric; O'Neil, Moira & Stanley, Kate. (2014). Beyond prevalence: An explanatory approach to reframing child maltreatment in the United Kingdom. *Child Abuse & Neglect*, *38*(5), 810–821. doi: 10.1016/j.chiabu.2014.04.019

Kenrick, Douglas T.; Griskevicius, Vladas; Neuberg, Steven L. & Schaller, Mark. (2010). Renovating the pyramid of needs: Contemporary extensions built upon ancient foundations. *Perspectives on Psychological Science*, *5*(3), 292–314. doi: 10.1177/1745691610369469

Keown, Louise J. & Palmer, Melanie. (2014). Comparisons between paternal and maternal involvement with sons: Early to middle childhood. *Early Child Development and Care*, *184*(1), 99–117. doi: 10.1080/03004430.2013.773510

Kesselring, Thomas & Müller, Ulrich. (2011). The concept of egocentrism in the context of Piaget's theory. *New Ideas in Psychology*, *29*(3), 327–345. doi: 10.1016/j.newideapsych.2010.03.008

Khafi, Tamar Y.; Yates, Tuppett M. & Luthar, Suniya S. (2014). Ethnic differences in the developmental significance of parentification. *Family Process*, *53*(2), 267–287. doi: 10.1111/famp.12072

Khanna, Sunil K. (2010). *Fetal/fatal knowledge: New reproductive technologies and family-building strategies in India*. Belmont, CA: Wadsworth/Cengage Learning.

Kharsati, Naphisabet & Bhola, Poornima. (2014). Patterns of non-suicidal self-injurious behaviours among college students in India. *International Journal of Social Psychiatry*. doi: 10.1177/0020764014535755

Killen, Melanie & Smetana, Judith G. (Eds.). (2014). *Handbook of moral development* (2nd ed.). New York, NY: Psychology Press.

Kilmer, Ryan P. & Gil-Rivas, Virginia. (2010). Exploring posttraumatic growth in children impacted by Hurricane Katrina: Correlates of the phenomenon and developmental considerations. *Child Development*, *81*(4), 1211–1227. doi: 10.1111/j.1467-8624.2010.01463.x

Kim, Geunyoung; Walden, Tedra A. & Knieps, Linda J. (2010). Impact and characteristics of positive and fearful emotional messages during infant social referencing. *Infant Behavior and Development*, *33*(2), 189–195. doi: 10.1016/j.infbeh.2009.12.009

Kim, Hojin I. & Johnson, Scott P. (2013). Do young infants prefer an infant-directed face or a happy face? *International Journal of Behavioral Development*, *37*(2), 125–130. doi: 10.1177/0165025413475972

Kim, Hyun Sik. (2011). Consequences of parental divorce for child development. *American Sociological Review*, *76*(3), 487–511. doi: 10.1177/0003122411407748

Kim, Heejung S. & Chu, Thai Q. (2011). Cultural variation in the motivation of self-expression. In David Dunning (Ed.), *Social motivation* (pp. 57–78). New York, NY: Psychology Press.

Kim, Heejung S. & Sasaki, Joni Y. (2014). Cultural neuroscience: Biology of the mind in cultural contexts. *Annual Review of Psychology*, *65*, 487–514. doi: 10.1146/annurev-psych-010213-115040

Kim, Hye Young; DeKruyff, Rosemarie H. & Umetsu, Dale T. (2010). The many paths to asthma: Phenotype shaped by innate and adaptive immunity. *Nature Immunology*, *11*(7), 577–584. doi: 10.1038/ni.1892

Kim, Joon Sik. (2011). Excessive crying: Behavioral and emotional regulation disorder in infancy. *Korean Journal of Pediatrics*, *54*(6), 229–233. doi: 10.3345/kjp.2011.54.6.229

King, Bruce M. (2013). The modern obesity epidemic, ancestral hunter-gatherers, and the sensory/reward control of food intake. *American Psychologist*, *68*(2), 88–96. doi: 10.1037/a0030684

Kinney, Hannah C. & Thach, Bradley T. (2009). The sudden infant death syndrome. *New England Journal of Medicine*, *361*, 795–805. doi: 10.1056/NEJMra0803836

Kirk, Elizabeth; Howlett, Neil; Pine, Karen J. & Fletcher, Ben. (2013). To sign or not to sign? The impact of encouraging infants to gesture on infant language and maternal mind-mindedness. *Child Development*, *84*(2), 574–590. doi: 10.1111/j.1467-8624.2012.01874.x

Klassen, Terry P.; Kiddoo, Darcie; Lang, Mia E.; Friesen, Carol; Russell, Kelly; Spooner, Carol & Vandermeer, Ben. (2006). *The effectiveness of different methods of toilet training for bowel and bladder control*. Rockville, MD: Agency for Healthcare Research and Quality, U.S. Department of Health and Human Services.

Klaus, Marshall H. & Kennell, John H. (1976). *Maternal-infant bonding: The impact of early separation or loss on family development*. St. Louis, MO: Mosby.

Klein, Denise; Mok, Kelvin; Chen, Jen-Kai & Watkins, Kate E. (2014). Age of language learning shapes brain structure: A cortical thickness study of bilingual and monolingual individuals. *Brain and Language*, *131*, 20–24. doi: 10.1016/j.bandl.2013.05.014

Klein, Hilary. (1991). Couvade syndrome: Male counterpart to pregnancy. *International Journal of Psychiatry in Medicine*, *21*(1), 57–69. doi: 10.2190/1110-92JM-C40N-J5C1

Klinger, Laura G.; Dawson, Geraldine; Burner, Karen & Crisler, Megan. (2014). Autism spectrum disorder. In Eric J. Mash & Russell A. Barkley (Eds.), *Child psychopathology* (3rd ed., pp. 531–572). New York, NY: Guilford Press.

Klug, William S.; Cummings, Michael R.; Spencer, Charlotte A. & Palladino, Michael A. (2008). *Concepts of genetics* (9th ed.). San Francisco, CA: Benjamin Cummings.

Knight, Rona. (2014). A hundred years of latency: From Freudian psychosexual theory to dynamic systems nonlinear development in middle childhood. *Journal of the American Psychoanalytic Association*, *62*(2), 203–235. doi: 10.1177/0003065114531044

Kochanek, Kenneth D.; Xu, Jiaquan; Murphy, Sherry L.; Miniño, Arialdi M. & Kung, Hsiang-Ching. (2011). *Deaths: Preliminary data for 2009*. Hyattsville, MD: National Center for Health Statistics, 59(4).

Kochanska, Grazyna; Barry, Robin A.; Jimenez, Natasha B.; Hollatz, Amanda L. & Woodard, Jarilyn. (2009). Guilt and effortful control: Two mechanisms that prevent disruptive developmental trajectories. *Journal of Personality and Social Psychology*, *97*(2), 322–333. doi: 10.1037/a0015471

Kohlberg, Lawrence. (1963). The development of children's orientations toward a moral order: I. Sequence in the development of moral thought. *Vita Humana*, *6*(1/2), 11–33. doi: 10.1159/000269667

Kohlberg, Lawrence; Levine, Charles & Hewer, Alexandra. (1983). *Moral stages: A current formulation and a response to critics*. New York, NY: Karger.

Kolb, Bryan & Whishaw, Ian Q. (2013). *An introduction to brain and behavior* (4th ed.). New York, NY: Worth.

Konner, Melvin. (2007). Evolutionary foundations of cultural psychology. In Shinobu Kitayama & Dov Cohen (Eds.), *Handbook of cultural psychology* (pp. 77–105). New York, NY: Guilford Press.

Konner, Melvin. (2010). *The evolution of childhood: Relationships, emotion, mind*. Cambridge, MA: Harvard University Press.

Kopp, Claire B. (2011). Development in the early years: Socialization, motor development, and consciousness. *Annual Review of Psychology*, *62*, 165–187. doi: 10.1146/annurev.psych.121208.131625

Koster-Hale, Jorie & Saxe, Rebecca. (2013). Functional neuroimaging of theory of mind. In Simon Baron-Cohen, et al. (Eds.), *Understanding other minds: Perspectives from developmental social neuroscience* (3rd ed., pp. 132–163). New York, NY: Oxford University Press.

Kouider, Sid; Stahlhut, Carsten; Gelskov, Sofie V.; Barbosa, Leonardo S.; Dutat, Michel; de Gardelle, Vincent, . . . Dehaene-Lambertz, Ghislaine. (2013). A neural marker of perceptual consciousness in infants. *Science*, *340*(6130), 376–380. doi: 10.1126/science.1232509

Kozhimannil, Katy B.; Law, Michael R. & Virnig, Beth A. (2013). Cesarean delivery rates vary tenfold among US hospitals; Reducing variation may address quality and cost issues. *Health Affairs*, *32*(3), 527–535. doi: 10.1377/hlthaff.2012.1030

Krebs, John R. (2009). The gourmet ape: Evolution and human food preferences. *American Journal of Clinical Nutrition*, *90*(3), 707S–711S. doi: 10.3945/ajcn.2009.27462B

Kremer, Peter; Elshaug, Christine; Leslie, Eva; Toumbourou, John W.; Patton, George C. & Williams, Joanne. (2014). Physical activity, leisure-time screen use and depression among children and young adolescents. *Journal of Science and Medicine in Sport*, *17*(2), 183–187. doi: 10.1016/j.jsams.2013.03.012

Krentz, Ursula C. & Corina, David P. (2008). Preference for language in early infancy: The human language bias is not speech specific. *Developmental Science*, *11*(1), 1–9. doi: 10.1111/j.1467-7687.2007.00652.x

Kretch, Kari S. & Adolph, Karen E. (2013). No bridge too high: Infants decide whether to cross based on the probability of falling not the severity of the potential fall. *Developmental Science*, *16*(3), 336–351. doi: 10.1111/desc.12045

Krogstad, Jens M. & Fry, Richard. (2014, August 18). *Dept. of Ed. projects public schools will be 'majority-minority' this fall*. Washington, DC: Pew Research Center.

Kuehn, Bridget M. (2011). Scientists find promising therapies for fragile X and Down syndromes. *JAMA*, *305*(4), 344–346. doi: 10.1001/jama.2010.1960

Kuhn, Louise; Reitz, Cordula & Abrams, Elaine J. (2009). Breastfeeding and AIDS in the developing world. *Current Opinion in Pediatrics*, *21*(1), 83–93. doi: 10.1097/MOP.0b013e328320d894

Kulkofsky, Sarah & Klemfuss, J. Zoe. (2008). What the stories children tell can tell about their memory: Narrative skill and young children's suggestibility. *Developmental Psychology*, *44*(5), 1442–1456. doi: 10.1037/a0012849

Kundu, Tapas K. (Ed.). (2013). *Epigenetics: Development and disease*. New York, NY: Springer. doi: 10.1007/978-94-007-4525-4

Kushnerenko, Elena; Tomalski, Przemyslaw; Ballieux, Haiko; Ribeiro, Helena; Potton, Anita; Axelsson, Emma L., . . . Moore, Derek G. (2013). Brain responses to audiovisual speech mismatch in infants are associated with individual differences in looking behaviour. *European Journal of Neuroscience*, *38*(9), 3363–3369. doi: 10.1111/ejn.12331

Kuwahara, Keisuke; Kochi, Takeshi; Nanri, Akiko; Tsuruoka, Hiroko; Kurotani, Kayo; Pham, Ngoc Minh, . . . Mizoue, Tetsuya. (2014). Flushing response modifies the association of alcohol consumption with markers of glucose metabolism in Japanese men and women. *Alcoholism: Clinical and Experimental Research*, *38*(4), 1042–1048. doi: 10.1111/acer.12323

Kyriakidou, Marilena; Blades, Mark & Carroll, Dan. (2014). Inconsistent findings for the eyes closed effect in children: The implications for interviewing child witnesses. *Frontiers in Psychology*, *5*, 488. doi: 10.3389/fpsyg.2014.00448

LaBar, Kevin S. (2007). Beyond fear: Emotional memory mechanisms in the human brain. *Current Directions in Psychological Science*, *16*(4), 173–177. doi: 10.1111/j.1467-8721.2007.00498.x

Lagattuta, Kristin H. (2014). Linking past, present, and future: Children's ability to connect mental states and emotions across time. *Child Development Perspectives*, *8*(2), 90–95. doi: 10.1111/cdep.12065

Lai, Stephanie A.; Benjamin, Rebekah G.; Schwanenflugel, Paula J. & Kuhn, Melanie R. (2014). The longitudinal relationship between reading fluency and reading comprehension skills in second-grade children. *Reading & Writing Quarterly: Overcoming Learning Difficulties*, *30*(2), 116–138. doi: 10.1080/10573569.2013.789785

Laible, Deborah; Panfile, Tia & Makariev, Drika. (2008). The quality and frequency of mother-toddler conflict: Links with attachment and temperament. *Child Development*, *79*(2), 426–443. doi: 10.1111/j.1467-8624.2007.01134.x

Lake, Neil. (2012). Labor, interrupted: Cesareans, "cascading interventions," and finding a sense of balance. *Harvard Magazine*, *115*(2), 21–26.

Lamb, Michael E. (1982). Maternal employment and child development: A review. In Michael E. Lamb (Ed.), *Nontraditional families: Parenting and child development* (pp. 45–69). Hillsdale, NJ: Erlbaum.

Lamb, Michael E. (Ed.). (2010). *The role of the father in child development* (5th ed.). Hoboken, NJ: Wiley.

Lamb, Michael E. (Ed.). (2013). *The father's role: Cross cultural perspectives*. New York, NY: Routledge.

Lamb, Michael E. (2014). How I got started: Drawn into the life of crime: Learning from, by, and for child victims and witnesses. *Applied Cognitive Psychology*, *28*(4), 607–611. doi: 10.1002/acp.3031

Lambert, Nathaniel M.; Fincham, Frank D.; Stillman, Tyler F.; Graham, Steven M. & Beach, Steven R. H. (2010). Motivating change in relationships. *Psychological Science*, *21*(1), 126–132. doi: 10.1177/0956797609355634

Landgren, Kajsa; Lundqvist, Anita & Hallström, Inger. (2012). Remembering the chaos - But life went on and the wound healed: A four year follow up with parents having had a baby with infantile colic. *The Open Nursing Journal*, *6*, 53–61. doi: 10.2174/1874434601206010053

Lando, Amy M. & Lo, Serena C. (2014). Consumer understanding of the benefits and risks of fish consumption during pregnancy. *American Journal of Lifestyle Medicine*, *8*(2), 88–92. doi: 10.1177/1559827613514704

Lane, Jonathan D. & Harris, Paul L. (2014). Confronting, representing, and believing counterintuitive concepts: Navigating the natural and the

supernatural. *Perspectives on Psychological Science*, 9(2), 144–160. doi: 10.1177/1745691613518078

Långström, Niklas; Rahman, Qazi; Carlström, Eva & Lichtenstein, Paul. (2010). Genetic and environmental effects on same-sex sexual behavior: A population study of twins in Sweden. *Archives of Sexual Behavior*, 39(1), 75–80. doi: 10.1007/s10508-008-9386-1

Lara-Cinisomo, Sandraluz; Fuligni, Allison Sidle & Karoly, Lynn A. (2011). Preparing preschoolers for kindergarten. In DeAnna M. Laverick & Mary Renck Jalongo (Eds.), *Transitions to early care and education* (Vol. 4, pp. 93–105). New York, NY: Springer. doi: 10.1007/978-94-007-0573-9_9

Larzelere, Robert; Cox, Ronald & Smith, Gail. (2010). Do nonphysical punishments reduce antisocial behavior more than spanking? A comparison using the strongest previous causal evidence against spanking. *BMC Pediatrics*, *10*(10). doi: 10.1186/1471-2431-10-10

Lau, Carissa; Ambalavanan, Namasivayam; Chakraborty, Hrishikesh; Wingate, Martha S. & Carlo, Waldemar A. (2013). Extremely low birth weight and infant mortality rates in the United States. *Pediatrics*, *131*(5), 855–860. doi: 10.1542/peds.2012-2471

Laurent, Heidemarie K. (2014). Clarifying the contours of emotion regulation: Insights from parent–child stress research. *Child Development Perspectives*, 8(1), 30–35. doi: 10.1111/cdep.12058

Laurino, Mercy Y.; Bennett, Robin L.; Saraiya, Devki S.; Baumeister, Lisa; Doyle, Debra L.; Leppig, Kathleen, . . . Raskind, Wendy H. (2005). Genetic evaluation and counseling of couples with recurrent miscarriage: Recommendations of the National Society of Genetic Counselors. *Journal of Genetic Counseling*, *14*(3), 165–181. doi: 10.1007/s10897-005-3241-5

Lavelli, Manuela & Fogel, Alan. (2005). Developmental changes in the relationship between the infant's attention and emotion during early face-to-face communication: The 2-month transition. *Developmental Psychology*, *41*(1), 265–280. doi: 10.1037/0012-1649.41.1.265

Leach, Penelope. (2011). The EYFS and the real foundations of children's early years. In Richard House (Ed.), *Too much, too soon?: Early learning and the erosion of childhood*. Stroud, UK: Hawthorn.

Leaper, Campbell. (2013). Gender development during childhood. In Philip D. Zelazo (Ed.), *The Oxford handbook of developmental psychology* (Vol. 2, pp. 326–377). New York, NY: Oxford University Press. doi: 10.1093/oxfordhb/9780199958474.013.0014

Leavitt, Judith W. (2009). *Make room for daddy: The journey from waiting room to birthing room*. Chapel Hill, NC: University of North Carolina Press.

Lee, Dohoon; Brooks-Gunn, Jeanne; McLanahan, Sara S.; Notterman, Daniel & Garfinkel, Irwin. (2013). The Great Recession, genetic sensitivity, and maternal harsh parenting. *Proceedings of the National Academy of Sciences*, *110*(34), 13780–13784. doi: 10.1073/pnas.1312398110

Lee, Jihyun & Porretta, David L. (2013). Enhancing the motor skills of children with autism spectrum disorders: A pool-based approach. *JOPERD: The Journal Of Physical Education, Recreation & Dance*, 84(1), 41–45. doi: 10.1080/07303084.2013.746154

Lee, RaeHyuck; Zhai, Fuhua; Brooks-Gunn, Jeanne; Han, Wen-Jui & Waldfogel, Jane. (2014). Head start participation and school readiness: Evidence from the early childhood longitudinal study–birth cohort. *Developmental Psychology*, 50(1), 202–215. doi: 10.1037/a0032280

Lee, Soojeong & Shouse, Roger C. (2011). The impact of prestige orientation on shadow education in South Korea. *Sociology of Education*, 84(3), 212–224. doi: 10.1177/0038040711411278

Legewie, Joscha & DiPrete, Thomas A. (2012). School context and the gender gap in educational achievement. *American Sociological Review*, 77(3), 463–485. doi: 10.1177/0003122412440802

Lehner, Ben. (2013). Genotype to phenotype: Lessons from model organisms for human genetics. *Nature Reviews Genetics*, *14*(3), 168–178. doi: 10.1038/nrg3404

Leman, Patrick J. & Björnberg, Marina. (2010). Conversation, development, and gender: A study of changes in children's concepts of punishment. *Child Development*, *81*(3), 958–971. doi: 10.1111/j.1467-8624.2010.01445.x

Lemish, Daphna & Kolucki, Barbara. (2013). Media and early childhood development. In Pia Rebello Britto, et al. (Eds.), *Handbook of early childhood development research and its impact on global policy*. New York, NY: Oxford University Press.

Leonard, Hayley C. & Hill, Elisabeth L. (2014). Review: The impact of motor development on typical and atypical social cognition and language: A systematic review. *Child and Adolescent Mental Health*, *19*(3), 163–170. doi: 10.1111/camh.12055

Lepper, Mark R.; Greene, David & Nisbett, Richard E. (1973). Undermining children's intrinsic interest with extrinsic reward: A test of the "overjustification" hypothesis. *Journal of Personality and Social Psychology*, 28(1), 129–137. doi: 10.1037/h0035519

Lerner, Claire & Dombro, Amy Laura. (2004). Finding your fit: Some temperament tips for parents. *Zero to Three*, *24*(4), 42–45.

Leslie, Mitch. (2012). Gut microbes keep rare immune cells in line. *Science*, 335(6075), 1428. doi. 10.1126/science.335.6075.1428

Lester, Patricia; Leskin, Gregory; Woodward, Kirsten; Saltzman, William; Nash, William; Mogil, Catherine, . . . Beardslee, William. (2011). Wartime deployment and military children: Applying prevention science to enhance family resilience. In Shelley MacDermid Wadsworth & David Riggs (Eds.), *Risk and resilience in U.S. military families* (pp. 149–173). New York, NY: Springer. doi: 10.1007/978-1-4419-7064-0_8

Leventhal, Bennett L. (2013). Complementary and alternative medicine: Not many compliments but lots of alternatives. *Journal of Child and Adolescent Psychopharmacology*, 23(1), 54–56. doi 10.1089/cap.2013.2312

Lewallen, Lynne P. (2011). The importance of culture in childbearing. *Journal of Obstetric, Gynecologic, & Neonatal Nursing*, *40*(1), 4–8. doi: 10.1111/j.1552-6909.2010.01209.x

Lewandowski, Lawrence J. & Lovett, Benjamin J. (2014). Learning disabilities. In Eric J. Mash & Russell A. Barkley (Eds.), *Child psychopathology* (3rd ed., pp. 625–669). New York, NY: Guilford Press.

Lewin, Kurt. (1943). Psychology and the process of group living. *Journal of Social Psychology*, *17*(1), 113–131. doi: 10.1080/00224545.1943.9712269

Lewis, Charlotte W.; Linsenmayer, Kristi A. & Williams, Alexis. (2010). Wanting better: A qualitative study of low-income parents about their children's oral health. *Pediatric Dentistry*, 32(7), 518–524.

Lewis, John D.; Theilmann, Rebecca J.; Townsend, Jeanne & Evans, Alan C. (2013). Network efficiency in autism spectrum disorder and its relation to brain overgrowth. *Frontiers in Human Neuroscience*, *7*, 845. doi: 10.3389/fnhum.2013.00845

Lewis, Lawrence B.; Antone, Carol & Johnson, Jacqueline S. (1999). Effects of prosodic stress and serial position on syllable omission in first words. *Developmental Psychology*, 35(1), 45–59. doi: 10.1037//0012-1649.35.1.45

Lewis, Michael. (2010). The emergence of human emotions. In Michael Lewis, et al. (Eds.), *Handbook of emotions* (3rd ed.). New York, NY: Guilford Press.

Lewis, Michael & Brooks, Jeanne. (1978). Self-knowledge and emotional development. In Michael Lewis & L. A. Rosenblum (Eds.), *Genesis of behavior* (Vol. 1, pp. 205–226). New York, NY: Plenum Press.

Lewis, Michael & Kestler, Lisa (Eds.). (2012). *Gender differences in prenatal substance exposure*. Washington, DC: American Psychological Association.

Lewis, Michael & Ramsay, Douglas. (2005). Infant emotional and cortisol responses to goal blockage. *Child Development*, 76(2), 518–530. doi: 10.1111/j.1467-8624.2005.00860.x

Lewis, Marc D. (2013). The development of emotional regulation: Integrating normative and individual differences through developmental neuroscience. In Philip D. Zelazo (Ed.), *The Oxford handbook of developmental psychology* (Vol. 2, pp. 81–97). New York, NY: Oxford University Press. doi: 10.1093/oxfordhb/9780199958474.013.0004

Lewkowicz, David J. (2010). Infant perception of audio-visual speech synchrony. *Developmental Psychology*, *46*(1), 66–77. doi: 10.1037/a0015579

Li, Jin; Fung, Heidi; Bakeman, Roger; Rae, Katharine & Wei, Wanchun. (2014). How European American and Taiwanese mothers talk to their children about learning. *Child Development*, 85(3), 1206–1221. doi: 10.1111/cdev.12172

Li, Weilin; Farkas, George; Duncan, Greg J.; Burchinal, Margaret R. & Vandell, Deborah Lowe. (2013). Timing of high-quality child care and cognitive, language, and preacademic development. *Developmental Psychology*, *49*(8), 1440–1451. doi: 10.1037/a0030613

Libertus, Klaus & Needham, Amy. (2010). Teach to reach: The effects of active vs. passive reaching experiences on action and perception. *Vision Research*, *50*(24), 2750–2757. doi: 10.1016/j.visres.2010.09.001

Libertus, Melissa E.; Feigenson, Lisa & Halberda, Justin. (2013). Is approximate number precision a stable predictor of math ability? *Learning and Individual Differences*, *25*, 126–133. doi: 10.1016/j.lindif.2013.02.001

Lillard, Angeline S. (2013). Playful learning and Montessori education. *American Journal of Play*, *5*(2), 157–186.

Lillard, Angeline S. & Else-Quest, Nicole. (2006). Evaluating Montessori education. *Science*, *313*(5795), 1893–1894. doi: 10.1126/science.1132362

Lillard, Angeline S.; Lerner, Matthew D.; Hopkins, Emily J.; Dore, Rebecca A.; Smith, Eric D. & Palmquist, Carolyn M. (2013). The impact of pretend play on children's development: A review of the evidence. *Psychological Bulletin*, *139*(1), 1–34. doi: 10.1037/a0029321

Limber, Susan P. (2011). Development, evaluation, and future directions of the Olweus Bullying Prevention Program. *Journal of School Violence*, *10*(1), 71–87. doi: 10.1080/15388220.2010.519375

Lin, Alex R. (2014). Examining students' perception of classroom openness as a predictor of civic knowledge: A cross-national analysis of 38 countries. *Applied Developmental Science*, *18*(1), 17–30. doi: 10.1080/10888691.2014.864204

Lincove, Jane A. & Painter, Gary. (2006). Does the age that children start kindergarten matter? Evidence of long-term educational and social outcomes. *Educational Evaluation and Policy Analysis*, *28*(2), 153–179. doi: 10.3102/01623737028002153

Liszkowski, Ulf; Schäfer, Marie; Carpenter, Malinda & Tomasello, Michael. (2009). Prelinguistic infants, but not chimpanzees, communicate about absent entities. *Psychological Science*, *20*(5), 654–660. doi: 10.1111/j.1467-9280.2009.02346.x

Liszkowski, Ulf & Tomasello, Michael. (2011). Individual differences in social, cognitive, and morphological aspects of infant pointing. *Cognitive Development*, *26*(1), 16–29. doi 10.1016/j.cogdev.2010.10.001

Livas-Dlott, Alejandra; Fuller, Bruce; Stein, Gabriela L.; Bridges, Margaret; Mangual Figueroa, Ariana & Mireles, Laurie. (2010). Commands, competence, and *cariño*: Maternal socialization practices in Mexican American families. *Developmental Psychology*, *46*(3), 566–578. doi: 10.1037/a0018016

Lloyd-Fox, Sarah; Blasi, Anna; Volein, Agnes; Everdell, Nick; Elwell, Claire E. & Johnson, Mark H. (2009). Social perception in infancy: A near infrared spectroscopy study. *Child Development*, *80*(4), 986–999. doi: 10.1111/j.1467-8624.2009.01312.x

Lobstein, Tim & Dibb, Sue. (2005). Evidence of a possible link between obesogenic food advertising and child overweight. *Obesity Reviews*, *6*(3), 203–208. doi: 10.1111/j.1467-789X.2005.00191.x

LoBue, Vanessa. (2013). What are we so afraid of? How early attention shapes our most common fears. *Child Development Perspectives*, *7*(1), 38–42. doi: 10.1111/cdep.12012

Lock, Margaret. (2013). The lure of the epigenome. *The Lancet*, *381*(9881), 1896–1897. doi 10.1016/S0140-6736(13)61149-6

Longo, Lawrence D. (2013). *The rise of fetal and neonatal physiology: Basic science to clinical care*. New York, NY: Springer.

Lorber, Michael F. & Egeland, Byron. (2011). Parenting and infant difficulty: Testing a mutual exacerbation hypothesis to predict early onset conduct problems. *Child Development*, *82*(6), 2006–2020. doi: 10.1111/j.1467-8624.2011.01652.x

Lovecky, Deirdre V. (2009). Moral sensitivity in young gifted children. In Tracy Cross & Don Ambrose (Eds.), *Morality, ethics, and gifted minds* (pp. 161–176). New York, NY: Springer. doi 10.1007/978-0-387-89368-6_13

Lowell, Darcy I.; Carter, Alice S.; Godoy, Leandra; Paulicin, Belinda & Briggs-Gowan, Margaret J. (2011). A randomized controlled trial of Child FIRST: A comprehensive home-based intervention translating research into early childhood practice. *Child Development*, *82*(1), 193–208. doi: 10.1111/j.1467-8624.2010.01550.x

Lowrey, Annie. (2014, March 16). Income gap, meet the longevity gap. *The New York Times*, p. BU1

Lubienski, Christopher; Puckett, Tiffany & Brewer, T. Jameson. (2013). Does homeschooling "work"? A critique of the empirical claims and agenda of advocacy organizations. *Peabody Journal of Education*, *88*(3), 378–392. doi 10.1080/0161956X.2013.798516

Luecken, Linda J.; Lin, Betty; Coburn, Shayna S.; MacKinnon, David P.; Gonzales, Nancy A. & Crnic, Keith A. (2013). Prenatal stress, partner support, and infant cortisol reactivity in low-income Mexican American families. *Psychoneuroendocrinology*, *38*(12), 3092–3101. doi: 10.1016/j.psyneuen.2013.09.006

Lukas, D. & Clutton-Brock, T. H. (2013). The evolution of social monogamy in mammals. *Science*, *341*(6145), 526–530. doi: 10.1126/science.1238677

Luo, Rufan; Tamis-LeMonda, Catherine S.; Kuchirko, Yana; Ng, Florrie F. & Liang, Eva. (2014). Mother-child book-sharing and children's storytelling skills in ethnically diverse, low-income families. *Infant and Child Development*, *23*(4), 402–425. doi: 10.1002/icd.1841

Lupski, James R. (2013). Genome mosaicism: One human, multiple genomes. *Science*, *341*(6144), 358–359. doi: 10.1126/science.1239043

Luthar, Suniya S. & Barkin, Samuel H. (2012). Are affluent youth truly "at risk"? Vulnerability and resilience across three diverse samples. *Development and Psychopathology*, *24*(2), 429–449. doi: 10.1017/S0954579412000089

Luthar, Suniya S.; Cicchetti, Dante & Becker, Bronwyn. (2000). The construct of resilience: A critical evaluation and guidelines for future work. *Child Development*, *71*(3), 543–562 doi: 10.1111/1467-8624.00164

Lyon, Thomas D.; Malloy, Lindsay C.; Quas, Jodi A. & Talwar, Victoria A. (2008). Coaching, truth induction, and young maltreated children's false allegations and false denials. *Child Development*, *79*(4), 914–929. doi: 10.1111/j.1467-8624.2008.01167.x

Lyons, Kristen E.; Ghetti, Simona & Cornoldi, Cesare. (2010). Age differences in the contribution of recollection and familiarity to false memory formation: A new paradigm to examine developmental reversals. *Developmental Science*, *13*(2), 355–362. doi: 10.1111/j.1467-7687.2009.00889.x

Lyons-Ruth, Karlen; Bronfman, Elisa & Parsons, Elizabeth. (1999). Maternal frightened, frightening, or atypical behavior and disorganized infant attachment patterns. *Monographs of the Society for Research in Child Development*, *64*(3), 67–96. doi: 10.1111/1540-5834.00034

MacDorman, Marian F. & Rosenberg, Harry M. (1993). *Trends in infant mortality by cause of death and other characteristics, 1960–88*. Hyattsville, MD: National Center for Health Statistics, 20(20).

Macgregor, Stuart; Lind, Penelope A.; Bucholz, Kathleen K.; Hansell, Narelle K.; Madden, Pamela A. F.; Richter, Melinda M., . . . Whitfield, John B. (2009). Associations of ADH and ALDH2 gene variation with self report alcohol reactions, consumption and dependence: An integrated analysis. *Human Molecular Genetics*, *18*(3), 580–593. doi: 10.1093/hmg/ddn372

Mackenzie, K. J.; Anderton, S. M. & Schwarze, J. (2014). Viral respiratory tract infections and asthma in early life: Cause and effect? *Clinical & Experimental Allergy*, *44*(1), 9–19. doi: 10.1111/cea.12159

MacLeod, Andrea; Fabiano-Smith, Leah; Boegner-Pagé, Sarah & Fontolliet, Salomé. (2013). Simultaneous bilingual language acquisition: The role of parental input on receptive vocabulary development. *Child Language Teaching and Therapy*, *29*(1), 131–142. doi: 10.1177/0265659012466862

Macosko, Evan Z. & McCarroll, Steven A. (2013). Our fallen genomes. *Science*, *342*(6158), 564–565. doi: 10.1126/science.1246942

Madsen, Kreesten M.; Lauritsen, Marlene B.; Pedersen, Carsten B.; Thorsen, Poul; Plesner, Anne-Marie; Andersen, Peter H. & Mortensen, Preben B. (2003). Thimerosal and the occurrence of autism: Negative ecological evidence from Danish population-based data. *Pediatrics*, *112*(3), 604–606.

Magnuson, Katherine & Waldfogel, Jane. (2014). Delivering high-quality early childhood education and care to low-income children: How well is the US doing? In Ludovica Gambaro, et al. (Eds.), *An equal start?: Providing quality early education and care for disadvantaged children* (pp. 193–218). Chicago, IL: Policy Press.

Majdandžić, Mirjana; Möller, Eline L.; de Vente, Wieke; Bögels, Susan M. & van den Boom, Dymphna C. (2013). Fathers' challenging parenting behavior prevents social anxiety development in their 4-year-old children: A longitudinal observational study. *Journal of Abnormal Child Psychology*, *42*(2), 301–310. doi: 10.1007/s10802-013-9774-4

Majercsik, Eszter. (2005). Hierachy of needs of geriatric patients. *Gerontology*, *51*(3), 170–173. doi: 10.1159/000083989

Makimoto, Kiyoko. (1998). Drinking patterns and drinking problems among Asian-Americans and Pacific Islanders. *Alcohol Health and Research World*, *22*(4), 270–275.

Malloy, Michael H. (2009). Impact of cesarean section on intermediate and late preterm births: United States, 2000–2003. *Birth*, *36*(1), 26–33. doi: 10.1111/j.1523-536X.2008.00292.x

Mandler, Jean M. (2004). *The foundations of mind: Origins of conceptual thought*. New York, NY: Oxford University Press.

Mandler, Jean M. & DeLoache, Judy. (2012). The beginnings of conceptual development. In Sabina M. Pauen (Ed.), *Early childhood development and later outcome*. New York, NY: Cambridge University Press.

Mann, Joshua R.; McDermott, Suzanne; Bao, Haikun & Bersabe, Adrian. (2009). Maternal genitourinary infection and risk of cerebral palsy. *Developmental Medicine & Child Neurology*, *51*(4), 282–288. doi: 10.1111/j.1469-8749.2008.03226.x

Månsson, Johanna & Stjernqvist, Karin. (2014). Children born extremely preterm show significant lower cognitive, language and motor function levels compared with children born at term, as measured by the Bayley-III at 2.5 years. *Acta Paediatrica*, *103*(5), 504–511. doi: 10.1111/apa.12585

Manuck, Stephen B. & McCaffery, Jeanne M. (2014). Gene-environment interaction. *Annual Review of Psychology*, *65*, 41–70. doi 10.1146/annurev-psych-010213-115100

Mar, Raymond A. (2011). The neural bases of social cognition and story comprehension. *Annual Review of Psychology*, *62*, 103–134. doi: 10.1146/annurev-psych-120709-145406

Marazita, John M. & Merriman, William E. (2010). Verifying one's knowledge of a name without retrieving it: A U-shaped relation to vocabulary size in early childhood. *Language Learning and Development*, *7*(1), 40–54. doi: 10.1080/15475441.2010.496099

March, John S.; Franklin, Martin E.; Leonard, Henrietta L. & Foa, Edna B. (2004). Obsessive-compulsive disorder. In Tracy L. Morris & John S. March (Eds.), *Anxiety disorders in children and adolescents* (2nd ed., pp. 212–240). New York, NY: Guilford Press.

Marcovitch, Stuart; Boseovski, Janet J.; Knapp, Robin J. & Kane, Michael J. (2010). Goal neglect and working memory capacity in 4- to 6-year-old children. *Child Development*, *81*(6), 1687–1695. doi: 10.1111/j.1467-8624.2010.01503.x

Marcus, Gary F. & Rabagliati, Hugh. (2009). Language acquisition, domain specificity, and descent with modification. In John Colombo, et al. (Eds.), *Infant pathways to language: Methods, models, and research disorders* (pp. 267–285). New York, NY: Psychology Press.

Mareschal, Denis & Kaufman, Jordy. (2012). Object permanence in infancy: Revisiting Baillargeon's drawbridge study. In Alan M. Slater & Paul C. Quinn (Eds.), *Developmental psychology: Revisiting the classic studies*. Thousand Oaks, CA: Sage.

Marette, André & Picard-Deland, Eliane. (2014). Yogurt consumption and impact on health: Focus on children and cardiometabolic risk. *American Journal Clinical Nutrition*, *99*(5), 1243S–1247S. doi: 10.3945/ajcn.113.073379

Marshall, Eliot. (2011). Waiting for the revolution. *Science*, *331*(6017), 526–529. doi: 10.1126/science.331.6017.526

Marshall, Eliot. (2014). An experiment in zero parenting. *Science*, *345*(6198), 752–754. doi 10.1126/science.345.6198.752

Martin, Carmel. (2014). *Common core implementation best practices*. Washington, DC: Center for American Progress.

Martin, Carol L.; Fabes, Richard; Hanish, Laura; Leonard, Stacie & Dinella, Lisa. (2011). Experienced and expected similarity to same-gender peers: Moving toward a comprehensive model of gender segregation. *Sex Roles*, *65*(5/6), 421–434. doi: 10.1007/s11199-011-0029-x

Martin, Carol L. & Ruble, Diane N. (2010). Patterns of gender development. *Annual Review of Psychology*, *61*, 353–381. doi: 10.1146/annurev.psych.093008.100511

Martin-Uzzi, Michele & Duval-Tsioles, Denise. (2013). The experience of remarried couples in blended families. *Journal of Divorce & Remarriage*, *54*(1), 43–57. doi 10.1080/10502556.2012.743828

Martinez, Gilbert A.; Dodd, David, A. & Samartgedes, Jo Ann. (1981). Milk feeding patterns in the United States during the first 12 months of life. *Pediatrics*, *68*(6), 863–868.

Martorell, Reynaldo & Young, Melissa F. (2012). Patterns of stunting and wasting: Potential explanatory factors. *Advances in Nutrition*, *3*(2), 227–233. doi: 10.3945/an.111.001107

Marvasti, Amir B. & McKinney, Karyn D. (2011). Does diversity mean assimilation? *Critical Sociology*, *37*(5), 631–650. doi 10.1177/0896920510380071

Mascarelli, Amanda. (2013). Growing up with pesticides. *Science*, *341*(6147), 740–741. doi: 10.1126/science.341.6147_740

Maski, Kiran P. & Kothare, Sanjeev V. (2013). Sleep deprivation and neurobehavioral functioning in children. *International Journal of Psychophysiology*, *89*(2), 259–264. doi: 10.1016/j.ijpsycho.2013.06.019

Maslow, Abraham H. (1997) *Motivation and personality* (3rd ed.). New York, NY: Pearson.

Maslow, Abraham H. (1999). *Toward a psychology of being* (3rd ed.). New York, NY: Wiley.

Masten, Ann S. (2013). Risk and resilience in development. In Philip D. Zelazo (Ed.), *The Oxford handbook of developmental psychology* (Vol. 2, pp. 579–607). New York, NY: Oxford University Press. doi: 10.1093/oxfordhb/9780199958474.013.0023

Masten, Ann S. (2014). *Ordinary magic. Resilience in development*. New York, NY: Guilford Press.

Mathews, T. J.; Menacker, Fay & MacDorman, Marian F. (2003). *Infant mortality statistics from the 2001 period linked birth/infant death data set*. Hyattsville, MD: National Center for Health Statistics, 52(2).

Mattar, Rejane; de Campos Mazo, Daniel Ferraz & Carrilho, Flair José. (2012). Lactose intolerance: Diagnosis, genetic, and clinical factors. *Clinical and Experimental Gastroenterology*, *5*, 113–121. doi: 10.2147/CEG.S32368

Maxwell, Lesli A. (2012). Achievement gaps tied to income found widening. *Education Week*, *31*(23), 1, 22–23.

Mayes, Rick; Bagwell, Catherine & Erkulwater, Jennifer L. (2009). *Medicating children: ADHD and pediatric mental health*. Cambridge, MA: Harvard University Press.

McAdams, Dan P. & Pals, Jennifer L. (2006). A new Big Five: Fundamental principles for an integrative science of personality. *American Psychologist*, *61*(3), 204–217. doi: 10.1037/0003-066X.61.3.204

McAlister, Anna R. & Peterson, Candida C. (2013). Siblings, theory of mind, and executive functioning in children aged 3–6 years: New longitudinal evidence. *Child Development*, *84*(4), 1442–1458. doi: 10.1111/cdev.12043

McCabe, Janice. (2011). Doing multiculturalism: An interactionist analysis of the practices of a multicultural sorority. *Journal of Contemporary Ethnography*, *40*(5), 521–549. doi 10.1177/0891241611403588

McCall, Robert B. (2013). The consequences of early institutionalization: Can institutions be improved? - Should they? *Child and Adolescent Mental Health*, *18*(4), 193–201. doi: 10.1111/camh.12025

McCarthy, Neil & Eberhart, Johann K. (2014). Gene ethanol interactions underlying fetal alcohol spectrum disorders. *Cellular and Molecular Life Sciences*, *71*(14), 2699–2706. doi 10.1007/s00018-014-1578-3

McCartney, Kathleen; Burchinal, Margaret; Clarke-Stewart, Alison; Bub, Kristen L.; Owen, Margaret T. & Belsky, Jay. (2010). Testing a series of causal propositions relating time in child care to children's externalizing behavior. *Developmental Psychology, 46*(1), 1–17. doi: 10.1037/a0017886

McCowan, Lesley M. E.; Dekker, Gustaaf A.; Chan, Eliza; Stewart, Alistair; Chappell, Lucy C.; Hunter, Misty, . . . North, Robyn A. (2009). Spontaneous preterm birth and small for gestational age infants in women who stop smoking early in pregnancy: Prospective cohort study. *BMJ, 338*, b1081. doi: 10.1136/bmj.b1081

McCright, Aaron M. & Dunlap, Riley E. (2011). The politicization of climate change and polarization in the American public's views of global warming, 2001–2010. *Sociological Quarterly, 52*(2), 155–194. doi: 10.1111/j.1533-8525.2011.01198.x

McFarlane, Alexander C. & Van Hooff, Miranda. (2009). Impact of childhood exposure to a natural disaster on adult mental health: 20-year longitudinal follow-up study. *The British Journal of Psychiatry, 195*(2), 142–148. doi: 10.1192/bjp.bp.108.054270

McIntyre, Donald A. (2002). *Colour blindness: Causes and effects*. Chester, UK: Dalton Publishing.

McKusick, Victor A. (2007). Mendelian inheritance in man and its online version, OMIM. *The American Journal of Human Genetics, 80*(4), 588–604. doi: 10.1086/514346

McLaren, Paul J.; Fellay, Jacques & Telenti, Amalio. (2013). European genetic diversity and susceptibility to pathogens. *Human Heredity, 76*(3–4), 187–193. doi: 10.1159/000357758

McLaurin, Jennie A. (2014). Migrant farm worker health. In Jacob C. Warren & K. Bryant Smalley (Eds.), *Rural public health: Best practices and preventive models* (pp. 227–240). New York, NY: Springer.

McLeod, Bryce D.; Wood, Jeffrey J. & Weisz, John R. (2007). Examining the association between parenting and childhood anxiety: A meta-analysis. *Clinical Psychology Review, 27*(2), 155–172. doi: 10.1016/j.cpr.2006.09.002

McManus, I. Chris; Moore, James; Freegard, Matthew & Rawles, Richard. (2010). Science in the making: Right Hand, Left Hand. III: Estimating historical rates of left-handedness. *Laterality: Asymmetries of Body, Brain and Cognition, 15*(1/2), 186–208. doi: 10.1080/13576500802565313

McShane, Kelly E. & Hastings, Paul D. (2009). The New Friends Vignettes: Measuring parental psychological control that confers risk for anxious adjustment in preschoolers. *International Journal of Behavioral Development, 33*(6), 481–495. doi: 10.1177/0165025409103874

Meadows, Sara. (2006). *The child as thinker: The development and acquisition of cognition in childhood* (2nd ed.). New York, NY: Routledge.

Meltzoff, Andrew N. & Gopnik, Alison. (2013). Learning about the mind from evidence: Children's development of intuitive theories of perception and personality. In Simon Baron-Cohen, et al. (Eds.), *Understanding other minds. Perspectives from developmental social neuroscience* (3rd ed., pp. 19–34). New York, NY: Oxford University Press. doi: 10.1093/acprof:oso/9780199692972.001.0001

Meltzoff, Andrew N. & Moore, M. Keith. (1999). A new foundation for cognitive development in infancy: The birth of the representational infant. In Ellin K. Scholnick, et al. (Eds.), *Conceptual development: Piaget's legacy* (pp. 53–78). Mahwah, NJ: Lawrence Erlbaum Associates.

Menary, Kyle; Collins, Paul F.; Porter, James N.; Muetzel, Ryan; Olson, Elizabeth A.; Kumar, Vipin, . . . Luciana, Monica. (2013). Associations between cortical thickness and general intelligence in children, adolescents and young adults. *Intelligence, 41*(5), 597–606. doi: 10.1016/j.intell.2013.07.010

Merikangas, Kathleen R.; He, Jian-ping; Rapoport, Judith; Vitiello, Benedetto & Olfson, Mark. (2013). Medication use in US youth with mental disorders. *JAMA Pediatrics, 167*(2), 141–148. doi: 10.1001/jamapediatrics.2013.431

Mersky, J. P.; Topitzes, J. & Reynolds, A. J. (2013). Impacts of adverse childhood experiences on health, mental health, and substance use in early adulthood: A cohort study of an urban, minority sample in the U.S. *Child Abuse & Neglect, 37*(11), 917–925. doi: 10.1016/j.chiabu.2013.07.011

Merz, Emily C. & McCall, Robert B. (2011). Parent ratings of executive functioning in children adopted from psychosocially depriving institutions. *Journal of Child Psychology and Psychiatry, 52*(5), 537–546. doi: 10.1111/j.1469-7610.2010.02335.x

Messinger, Daniel M.; Ruvolo, Paul; Ekas, Naomi V. & Fogel, Alan. (2010). Applying machine learning to infant interaction: The development is in the details. *Neural Networks, 23*(8/9), 1004–1016. doi: 10.1016/j.neunet.2010.08.008

Metcalfe, Janet & Finn, Bridgid. (2013). Metacognition and control of study choice in children. *Metacognition and Learning, 8*(1), 19–46. doi: 10.1007/s11409-013-9094-7

Metcalfe, Lindsay A.; Harvey, Elizabeth A. & Laws, Holly B. (2013). The longitudinal relation between academic/cognitive skills and externalizing behavior problems in preschool children. *Journal of Educational Psychology, 105*(3), 881–894. doi: 10.1037/a0032624

Miklowitz, David J. & Cicchetti, Dante (Eds.). (2010). *Understanding bipolar disorder: A developmental psychopathology perspective*. New York, NY: Guilford Press.

Miles, Lynden K. (2009). Who is approachable? *Journal of Experimental Social Psychology, 45*(1), 262–266. doi: 10.1016/j.jesp.2008.08.010

Miller, Cindy F.; Martin, Carol Lynn; Fabes, Richard A. & Hanish, Laura D. (2013). Bringing the cognitive and the social together: How gender detectives and gender enforcers shape children's gender development. In Mahzarin R. Banaji & Susan A. Gelman (Eds.), *Navigating the social world: What infants, children, and other species can teach us* (pp. 306–313). New York, NY: Oxford University Press.

Miller, Greg. (2006). The thick and thin of brainpower: Developmental timing linked to IQ. *Science, 311*(5769), 1851. doi: 10.1126/science.311.5769.1851

Miller, Greg. (2010). New clues about what makes the human brain special. *Science, 330*(6008), 1167. doi: 10.1126/science.330.6008.1167

Miller, Gregory E. & Chen, Edith. (2010). Harsh family climate in early life: Presages the emergence of a proinflammatory phenotype in adolescence. *Psychological Science, 21*(6), 848–856. doi: 10.1177/0956797610370161

Miller, Joan G. (2004). The cultural deep structure of psychological theories of social development. In Robert J. Sternberg & Elena L. Grigorenko (Eds.), *Culture and competence: Contexts of life success* (pp. 111–138). Washington, DC: American Psychological Association.

Miller, Orlando J. & Therman, Eeva. (2001). *Human chromosomes* (4th ed.). New York, NY: Springer.

Miller, Portia; Votruba-Drzal, Elizabeth; Coley, Rebekah Levine & Koury, Amanda S. (2014). Immigrant families' use of early childcare: Predictors of care type. *Early Childhood Research Quarterly, 29*(4), 484–498. doi: 10.1016/j.ecresq.2014.05.011

Miller, Patricia H. (2011). *Theories of developmental psychology* (5th ed.). New York, NY: Worth Publishers.

Mills, Jon (Ed.). (2004). *Psychoanalysis at the limit: Epistemology, mind, and the question of science*. Albany, NY: State University of New York Press.

Mills, James L.; McPartlin, Joseph M.; Kirke, Peadar N.; Lee, Young J.; Conley, Mary R.; Weir, Donald G. & Scott, John M. (1995). Homocysteine metabolism in pregnancies complicated by neural-tube defects. *The Lancet, 345*(8943), 149–151. doi: 10.1016/S0140-6736(95)90165-5

Mills-Koonce, W. Roger; Garrett-Peters, Patricia; Barnett, Melissa; Granger, Douglas A.; Blair, Clancy & Cox, Martha J. (2011). Father contributions to cortisol responses in infancy and toddlerhood. *Developmental Psychology, 47*(2), 388–395. doi: 10.1037/a0021066

Milunsky, Aubrey. (2011). *Your genes, your health: A critical family guide that could save your life*. New York, NY: Oxford University Press.

Minagawa-Kawai, Yasuyo; van der Lely, Heather; Ramus, Franck; Sato, Yutaka; Mazuka, Reiko & Dupoux, Emmanuel. (2011). Optical brain imaging reveals general auditory and language-specific processing in early infant development. *Cerebral Cortex, 21*(2), 254–261. doi: 10.1093/cercor/bhq082

Mindell, Jodi A.; Sadeh, Avi; Wiegand, Benjamin; How, Ti Hwei & Goh, Daniel Y. T. (2010). Cross-cultural differences in infant and

toddler sleep. *Sleep Medicine, 11*(3), 274–280. doi: 10.1016/j.sleep.2009.04.012

Miniño, Arialdi M.; Heron, Melonie P.; Murphy, Sherry L. & Kochanek, Kenneth D. (2007). *Deaths: Final data for 2004.* Hyattsville, MD: National Center for Health Statistics, 55(19).

Minogue, Kristen. (2010). China's brain mappers zoom in on neural connections. *Science, 330*(6005), 747. doi: 10.1126/science.330.6005.747

Mischel, Walter. (2014). *The marshmallow test: Mastering self-control.* New York, NY: Little, Brown and Company.

Mishra, Ramesh C.; Singh, Sunita & Dasen, Pierre R. (2009). Geocentric dead reckoning in Sanskrit- and Hindi-medium school children. *Culture & Psychology, 15*(3), 386–408. doi: 10.1177/1354067x09343330

Misra, Dawn P.; Caldwell, Cleopatra; Young, Alford A. & Abelson, Sara. (2010). Do fathers matter? Paternal contributions to birth outcomes and racial disparities. *American Journal of Obstetrics and Gynecology, 202*(2), 99–100. doi: 10.1016/j.ajog.2009.11.031

Missana, Manuela; Rajhans, Purva; Atkinson, Anthony P. & Grossmann, Tobias. (2014). Discrimination of fearful and happy body postures in 8-month-old infants: An event related potential study. *Frontiers in Human Neuroscience, 8*, 531. doi: 10.3389/fnhum.2014.00531

Mitchell, Edwin A. (2009). SIDS: Past, present and future. *Acta Paediatrica, 98*(11), 1712–1719. doi: 10.1111/j.1651-2227.2009.01503.x

Mitchell, Philip B.; Meiser, Bettina; Wilde, Alex; Fullerton, Janice; Donald, Jennifer; Wilhelm, Kay & Schofield, Peter R. (2010). Predictive and diagnostic genetic testing in psychiatry. *Psychiatric Clinics of North America, 33*(1), 225–243. doi: 10.1016/j.psc.2009.10.001

Miyata, Susanne; MacWhinney, Brian; Otomo, Kiyoshi; Sirai, Hidetosi; Oshima-Takane, Yuriko; Hirakawa, Makiko, . . . Itoh, Keiko. (2013). Developmental sentence scoring for Japanese. *First Language, 33*(2), 200–216. doi: 10.1177/0142723713479436

Mize, Krystal D.; Pineda, Melannie; Blau, Alexis K.; Marsh, Kathryn & Jones, Nancy A. (2014). Infant physiological and behavioral responses to a jealousy provoking condition. *Infancy, 19*(3), 338–348. doi: 10.1111/infa.12046

MMWR. (2002, September 13). *Folic acid and prevention of spina bifida and anencephaly: 10 years after the U.S. public health service recommendation.* Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, *51*(RR13), 1–3.

MMWR. (2008, January 18). *School-associated student homicides - United States, 1992–2006.* Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 57(2), 33–36.

MMWR. (2011, January 7). *Notifiable diseases and mortality tables.* Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 59(52), 1704–1717.

MMWR. (2012, July 20). *Alcohol Use and Binge Drinking Among Women of Childbearing Age–United States, 2006–2010.* Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, *61*(28), 534–538.

MMWR. (2012, June 8). *Youth risk behavior surveillance - United States, 2011.* Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, *61*(4).

MMWR. (2013, April 5). *Blood lead levels in children aged 1–5 Years—United States, 1999–2010.* Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 62(13), 245–248.

MMWR. (2013, August 9). *Vital signs: Obesity among low-income, preschool-aged children—United States, 2008–2011.* Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 62(31), 629–634.

MMWR. (2013, January 18). *Obesity prevalence among low-income, preschool-aged children -New York City and Los Angeles County, 2003–2011.* Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 62(2), 17–22

MMWR. (2014, August 29). *National, state, and selected local area vaccination coverage among children aged 19–35 months—United States, 2013.* Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 63(34), 741–748

MMWR. (2014, June 6). *Measles—United States, January 1–May 23, 2014.* Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 63(22), 496–499.

MMWR. (2014, June 13). *Youth risk behavior surveillance—United States, 2013.* Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, *64*(4).

MMWR. (2014, March 7). *Impact of requiring influenza vaccination for children in licensed child care or preschool programs -Connecticut, 2012–13 influenza season.* Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 63(9), 181–185.

MMWR. (2014, March 28). *Prevalence of autism spectrum disorder among children aged 8 years—Autism and Developmental Disabilities Monitoring Network, 11 sites, United States, 2010.* Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 63(2).

MMWR. (2014, May 2). *QuickStats: Percentage of children aged 6–17 years prescribed medication during the preceding 6 months for emotional or behavioral difficulties, by census region—National Health Interview Survey, United States, 2011–2012.* Atlanta, GA: Centers for Disease Control and Prevention, 63(17), 389–389.

MMWR. (2014, May 16). *Racial/ethnic disparities in fatal unintentional drowning among persons aged ≤29 years—United States, 1999–2010.* Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 63(19), 421–426.

Moffitt, Terrie E.; Arseneault, Louise; Belsky, Daniel; Dickson, Nigel; Hancox, Robert J.; Harrington, HonaLee, . . . Caspi, Avshalom. (2011). A gradient of childhood self-control predicts health, wealth, and public safety. *Proceedings of the National Academy of Sciences of the United States of America, 108*(7), 2693–2698. doi: 10.1073/pnas.1010076108

Mokrova, Irina L.; O'Brien, Marion; Calkins, Susan D.; Leerkes, Esther M. & Marcovitch, Stuart. (2013). The role of persistence at preschool age in academic skills at kindergarten. *European Journal of Psychology of Education, 28*(4), 1495–1503. doi: 10.1007/s10212-013-0177-2

Moldavsky, Maria & Sayal, Kapil. (2013). Knowledge and attitudes about Attention-deficit/hyperactivity disorder (ADHD) and its treatment: The views of children, adolescents, parents, teachers and healthcare professionals. *Current Psychiatry Reports, 15*, 377. doi: 10.1007/s11920-013-0377-0

Molina, Brooke S. G.; Hinshaw, Stephen P.; Arnold, L. Eugene; Swanson, James M.; Pelham, William E.; Hechtman, Lily, . . . Marcus, Sue. (2013). Adolescent substance use in the Multimodal Treatment Study of Attention-deficit/hyperactivity disorder (ADHD) (MTA) as a function of childhood ADHD, random assignment to childhood treatments, and subsequent medication. *Journal of the American Academy of Child & Adolescent Psychiatry, 52*(3), 250–263. doi: 10.1016/j.jaac.2012.12.014

Molina, Brooke S. G.; Hinshaw, Stephen P.; Swanson, James W.; Arnold, L. Eugene; Vitiello, Benedetto; Jensen, Peter S., . . . Houck, Patricia R. (2009). The MTA at 8 years: Prospective follow-up of children treated for combined-type ADHD in a multisite study. *Journal of the American Academy of Child and Adolescent Psychiatry, 48*(5), 484–500. doi: 10.1097/CHI.0b013e31819c23d0

Møller, Signe J. & Tenenbaum, Harriet R. (2011). Danish majority children's reasoning about exclusion based on gender and ethnicity. *Child Development, 82*(2), 520–532. doi: 10.1111/j.1467-8624.2010.01568.x

Monks, Claire P. & Coyne, Iain (Eds.). (2011). *Bullying in different contexts.* New York, NY: Cambridge University Press.

Monte, Lindsay M. & Ellis, Renee R. (2014). *Fertility of women in the United States, 2012 Population characteristics.* Washington, DC: U.S. Department of Commerce, Economics and Statistics Administration, U.S. Census Bureau.

Monteiro, Carlos A.; Conde, Wolney L. & Popkin, Barry M. (2004). The burden of disease from undernutrition and overnutrition in countries undergoing rapid nutrition transition: A view from Brazil. *American Journal of Public Health, 94*(3), 433–434. doi: 10.2105/AJPH.94.3.433

Monteiro, Carlos A.; Levy, Renata B.; Claro, Rafael M.; Ribeiro de Castro, Inês Rugani &

Cannon, Geoffrey. (2011). Increasing consumption of ultra-processed foods and likely impact on human health: Evidence from Brazil. *Public Health Nutrition, 14*(1), 5–13. doi: 10.1017/S1368980010003344

Monthly Vital Statistics Report. (1980). *Final mortality statistics, 1978: Advance report.* Hyattsville, MD: National Center for Health Statistics, *29*(6, Suppl. 2).

Moore, Keith L. & Persaud, T. V. N. (2007). *The developing human: Clinically oriented embryology* (8th ed.). Philadelphia, PA: Saunders/Elsevier.

Moore, Keith L. & Persaud, T. V. N. (2008). *The developing human: Clinically oriented embryology* (8th ed.). Philadelphia, PA: Saunders.

Moran, Lyndsey R.; Lengua, Liliana J. & Zalewski, Maureen. (2013). The interaction between negative emotionality and effortful control in early social-emotional development. *Social Development, 22*(2), 340–362. doi: 10.1111/sode.12025

Morawska, Alina & Sanders, Matthew. (2011). Parental use of time out revisited: A useful or harmful parenting strategy? *Journal of Child and Family Studies, 20*(1), 1–8. doi: 10.1007/s10826-010-9371-x

Morelli, Gilda A. & Rothbaum, Fred. (2007). Situating the child in context: Attachment relationships and self-regulation in different cultures. In Shinobu Kitayama & Dov Cohen (Eds.), *Handbook of cultural psychology* (pp. 500–527). New York, NY: Guilford Press.

Morgan, Ian G.; Ohno-Matsui, Kyoko & Saw, Seang-Mei. (2012). Myopia. *The Lancet, 379*(9827), 1739–1748. doi: 10.1016/S0140-6736(12)60272-4

Morgan, Paul L.; Staff, Jeremy; Hillemeier, Marianne M.; Farkas, George & Maczuga, Steven. (2013). Racial and ethnic disparities in ADHD diagnosis from kindergarten to eighth grade. *Pediatrics, 132*(1), 85–93. doi: 10.1542/peds.2012-2390

Morning, Ann. (2008). Ethnic classification in global perspective: A cross-national survey of the 2000 census round. *Population Research and Policy Review, 27*(2), 239–272. doi: 10.1007/s11113-007-9062-5

Morones, Alyssa. (2013). Paddling persists in U.S. schools. *Education Week, 33*(9), 1, 10–11.

Morris, Amanda S.; Silk, Jennifer S.; Steinberg, Laurence; Myers, Sonya S. & Robinson, Lara R. (2007). The role of the family context in the development of emotion regulation. *Social Development, 16*(2), 361–388. doi: 10.1111/j.1467-9507.2007.00389.x

Morrissey, Taryn. (2009). Multiple child-care arrangements and young children's behavioral outcomes. *Child Development, 80*(1), 59–76. doi: 10.1111/j.1467-8624.2008.01246.x

Mosher, William D.; Jones, Jo & Abma, Joyce C. (2012). *Intended and unintended births in the United States: 1982–2010.* Hyattsville, MD: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics, 55, 1–27.

Motel, Seth. (2014). *6 facts about marijuana.* Washington, DC: Pew Research Center.

Moulson, Margaret C.; Westerlund, Alissa; Fox, Nathan A.; Zeanah, Charles H. & Nelson, Charles A. (2009). The effects of early experience on face recognition: An event-related potential study of institutionalized children in Romania. *Child Development, 80*(4), 1039–1056. doi: 10.1111/j.1467-8624.2009.01315.x

Moyer, Virginia A. (2014). Prevention of dental caries in children from birth through age 5 years: US Preventive Services Task Force Recommendation Statement. *Pediatrics, 133*(6), 1102–1111. doi: 10.1542/peds.2014-0483

Mulder, Pamela J. & Johnson, Teresa S. (2010). The Beginning Breastfeeding Survey Measuring mothers' perceptions of breastfeeding effectiveness during the postpartum hospitalization. *Research in Nursing & Health, 33*(4), 329–344. doi: 10.1002/nur.20384

Mullally, Sinéad L. & Maguire, Eleanor A. (2014). Learning to remember: The early ontogeny of episodic memory. *Developmental Cognitive Neuroscience, 9*(13), 12–29. doi: 10.1016/j.den.2013.12.006

Müller, Ulrich; Dick, Anthony S.; Gela, Katherine; Overton, Willis F. & Zelazo, Philip D. (2006). The role of negative priming in preschoolers' flexible rule use on the dimensional change card sort task. *Child Development, 77*(2), 395–412. doi: 10.1111/j.1467-8624.2006.00878.x

Mulligan, A.; Anney, R.; Butler, L.; O'Regan, M.; Richardson, T.; Tulewicz, E. M., . . . Gill, M. (2013). Home environment: Association with hyperactivity/impulsivity in children with ADHD and their non-ADHD siblings. *Child: Care, Health & Development, 39*(2), 202–212. doi: 10.1111/j.1365-2214.2011.01345.x

Mullis, Ina V. S.; Martin, Michael O.; Foy, Pierre & Arora, A. (2012a). *TIMSS 2011 International Results in Mathematics.* Chestnut Hill, MA: TIMSS & PIRLS International Study Center, Boston College.

Mullis, Ina V. S.; Martin, Michael O.; Foy, Pierre & Drucker, Kathleen T. (2012b). *PIRLS 2011 international results in reading.* Chestnut Hill, MA: TIMSS & PIRLS International Study Center, Boston College.

Muñoz, Carmen & Singleton, David. (2011). A critical review of age-related research on L2 ultimate attainment. *Language Teaching, 44*(1), 1–35. doi: 10.1017/S0261444810000327

Muraskas, Jonathan K.; Rau, Brian J.; Castillo, Patricia Rae; Gianopoulos, John & Boyd, Lauren A. C. (2012). Long-term follow-up of 2 newborns with a combined birth weight of 540 grams. *Pediatrics, 129*(1), e174–e178. doi: 10.1542/peds.2010-0039

Muris, Peter & Meesters, Cor. (2014). Small or big in the eyes of the other: On the developmental psychopathology of self-conscious emotions as shame, guilt, and pride. *Clinical Child and Family Psychology Review, 17*(1), 19–40. doi: 10.1007/s10567-013-0153-7

Murphy, Sherry L.; Xu, Jiaquan & Kochanek, Kenneth D. (2012). *Deaths: Preliminary data for 2010.* Hyattsville, MD: National Center for Health Statistics, *60*(4).

Murray, Thomas H. (2014). Stirring the simmering "designer baby" pot. *Science, 343*(6176), 1208–1210. doi: 10.1126/science.1248080

Naci, Huseyin; Chisholm, Dan & Baker, T. D. (2009). Distribution of road traffic deaths by road user group: A global comparison. *Injury Prevention, 15*(1), 55–59. doi: 10.1136/ip.2008.018721

Nadeau, Joseph H. & Dudley, Aimée M. (2011). Systems genetics. *Science, 331*(6020), 1015–1016. doi: 10.1126/science.1203869

NAEYC. (2014). *NAEYC Early Childhood Program Standards and Accreditation Criteria & Guidance for Assessment.* Washington, DC: National Association for the Education of Young Children.

Narayan, Chandan R.; Werker, Janet F. & Beddor, Patrice Speeter. (2010). The interaction between acoustic salience and language experience in developmental speech perception: Evidence from nasal place discrimination. *Developmental Science, 13*(3), 407–420. doi: 10.1111/j.1467-7687.2009.00898.x

Narvaez, Darcia & Lapsley, Daniel K. (2009). Moral identity, moral functioning, and the development of moral character. *Psychology of Learning and Motivation, 50*, 237–274. doi: 10.1016/S0079-7421(08)00408-8

National Center for Education Statistics. (2009). *The condition of education 2009.* Washington, DC: Institute of Education Sciences, U.S. Department of Education.

National Center for Education Statistics. (2013a). *The Nation's report card: A first look: 2013 mathematics and reading.* Washington, DC: Institute of Education Sciences, U.S. Department of Education.

National Center for Education Statistics. (2013b). *Table 204.30: Children 3 to 21 years old served under Individuals with Disabilities Education Act (IDEA), Part B, by type of disability: Selected years, 1976–77 through 2011–12.* Washington, DC: Institute of Education Sciences, U.S. Department of Education.

National Center for Environmental Health. (2012). *Tested and confirmed elevated blood lead levels by state, year and blood lead level group for children <72 months.* Atlanta, GA: Centers for Disease Control and Prevention.

National Center for Health Statistics. (2013). *Health, United States, 2012: With special feature on emergency care.* Hyattsville, MD: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention.

National Governors Association Center for Best Practices (NGA Center) and the Council of Chief State School Officers (CCSSO). (2010, October 25). *Common core state standards initiative.* Washington, DC: National Governors Association.

National Vital Statistics Reports. (2013). *Table 3. Number of deaths and death rates, by age,*

race, and sex: United States, 2012. Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention.

National Vital Statistics Reports. (Forthcoming). *Deaths: Final data for 2012*. Hyattsville, MD: National Center for Health Statistics, 63(9).

Natsuaki, Misaki N.; Leve, Leslie D.; Neiderhiser, Jenae M.; Shaw, Daniel S.; Scaramella, Laura V.; Ge, Xiaojia & Reiss, David. (2013). Intergenerational transmission of risk for social inhibition: The interplay between parental responsiveness and genetic influences. *Development and Psychopathology, 25*(1), 261–274. doi: 10.1017/S0954579412001010

Naudé, H.; Marx, J.; Pretorius, E. & Hislop-Esterhuyzen, N. (2007). Evidence of early childhood defects due to prenatal overexposure to vitamin A: A case study. *Early Child Development and Care, 177*(3), 235–253. doi: 10.1080/03004430500456149

Naughton, Michelle J.; Yi-Frazier, Joyce P.; Morgan, Timothy M.; Seid, Michael; Lawrence, Jean M.; Klingensmith, Georgeanna J., . . . Loots, Beth. (2014). Longitudinal associations between sex, diabetes self-care, and health-related quality of life among youth with type 1 or type 2 diabetes mellitus. *The Journal of Pediatrics, 164*(6), 1376–1383.e1371. doi: 10.1016/j.jpeds.2014.01.027

Neary, Karen R. & Friedman, Ori. (2014). Young children give priority to ownership when judging who should use an object. *Child Development, 85*(1), 326–337. doi: 10.1111/cdev.12120

Neary, Marianne T. & Breckenridge, Ross A. (2013). Hypoxia at the heart of sudden infant death syndrome? *Pediatric Research, 74*(4), 375–379. doi: 10.1038/pr.2013.122

Needleman, Herbert L. & Gatsonis, Constantine A. (1990). Low-level lead exposure and the IQ of children: A meta-analysis of modern studies. *JAMA, 263*(5), 673–678. doi: 10.1001/jama.1990.03440050067035

Needleman, Herbert L.; Schell, Alan; Bellinger, David; Leviton, Alan & Allred, Elizabeth N. (1990). The long-term effects of exposure to low doses of lead in childhood. *New England Journal of Medicine, 322*(2), 83–88. doi: 10.1056/NEJM199001113220203

Neggers, Yasmin & Crowe, Kristi. (2013). Low birth weight outcomes: Why better in Cuba than Alabama? *Journal of the American Board of Family Medicine, 26*(2), 187–195. doi: 10.3122/jabfm.2013.02.120227

Neigh, Gretchen N.; Gillespie, Charles F. & Nemeroff, Charles B. (2009). The neurobiological toll of child abuse and neglect. *Trauma, Violence, & Abuse, 10*(4), 389–410. doi: 10.1177/1524838009339758

Nelson, Charles A.; Fox, Nathan A. & Zeanah, Charles H. (2014). *Romania's abandoned children: Deprivation, brain development, and the struggle for recovery*. Cambridge, MA: Harvard University Press.

Nelson, Charles A.; Zeanah, Charles H.; Fox, Nathan A.; Marshall, Peter J.; Smyke, Anna T. & Guthrie, Donald. (2007). Cognitive recovery in socially deprived young children: The Bucharest Early Intervention Project. *Science, 318*(5858), 1937–1940. doi: 10.1126/science.1143921

Nelson, Eric E.; Lau, Jennifer Y. F. & Jarcho, Johanna M. (2014). Growing pains and pleasures: How emotional learning guides development. *Trends in Cognitive Sciences, 18*(2), 99–108. doi: 10.1016/j.tics.2013.11.003

Nelson, Geoffrey & Caplan, Rachel. (2014). The prevention of child physical abuse and neglect: An update. *Journal of Applied Research on Children: Informing Policy for Children at Risk, 5*(1)

Nesdale, Drew; Zimmer-Gembeck, Melanie J. & Roxburgh, Natalie. (2014). Peer group rejection in childhood: Effects of rejection ambiguity, rejection sensitivity, and social acumen. *Journal of Social Issues, 70*(1), 12–28. doi: 10.1111/josi.12044

Neuman, Susan B.; Kaefer, Tanya; Pinkham, Ashley & Strouse, Gabrielle. (2014). Can babies learn to read? A randomized trial of baby media. *Journal of Educational Psychology, 106*(3), 815–830. doi: 10.1037/a0035937

Nevanen, Saila; Juvonen, Antti & Ruismäki, Heikki. (2014). Does arts education develop school readiness? Teachers' and artists' points of view on an art education project. *Arts Education Policy Review, 115*(3), 72–81. doi: 10.1080/10632913.2014.913970

Nevin, Rick. (2007). Understanding international crime trends: The legacy of preschool lead exposure. *Environmental Research, 104*(3), 315–336. doi: 10.1016/j.envres.2007.02.008

Newnham, Carol A.; Milgrom, Jeannette & Skouteris, Helen. (2009). Effectiveness of a modified mother-infant transaction program on outcomes for preterm infants from 3 to 24 months of age. *Infant Behavior and Development, 32*(1), 17–26. doi: 10.1016/j.infbeh.2008.09.004

Ng, Florrie Fei-Yin; Pomerantz, Eva M. & Deng, Ciping. (2014). Why are Chinese mothers more controlling than American mothers? "My child is my report card". *Child Development, 85*(1), 355–369. doi: 10.1111/cdev.12102

Ng, Marie; Fleming, Tom; Robinson, Margaret; Thomson, Blake; Graetz, Nicholas; Margono, Christopher, . . . Gakidou, Emmanuela. (2014). Global, regional, and national prevalence of overweight and obesity in children and adults during 1980–2013: A systematic analysis for the Global Burden of Disease Study 2013. *The Lancet, 384*(9945), 766–781. doi: 10.1016/S0140-6736(14)60460-8

Ngui, Emmanuel; Cortright, Alicia & Blair, Kathleen. (2009). An investigation of paternity status and other factors associated with racial and ethnic disparities in birth outcomes in Milwaukee, Wisconsin. *Maternal and Child Health Journal, 13*(4), 467–478. doi: 10.1007/s10995-008-0383-8

Nguyen, H.T.; Geens, Mieke & Spits, C. (2013). Genetic and epigenetic instability in human pluripotent stem cells. *Human Reproduction Update, 19*(2), 187–205. doi: 10.1093/humupd/dms048

Niclasen, Janni; Andersen, Anne-Marie N.; Strandberg-Larsen, Katrine & Teasdale, Thomas W. (2014). Is alcohol binge drinking in early and late pregnancy associated with behavioural and emotional development at age 7 years? *European Child & Adolescent Psychiatry*. doi: 10.1007/s00787-013-0511-x

Nielsen, Mark & Tomaselli, Keyan. (2010). Overimitation in Kalahari Bushman children and the origins of human cultural cognition. *Psychological Science, 21*(5), 729–736. doi: 10.1177/0956797610368808

Nielsen, Mark; Tomaselli, Keyan; Mushin, Ilana & Whiten, Andrew. (2014). Exploring tool innovation: A comparison of Western and Bushman children. *Journal of Experimental Child Psychology, 126*, 384–394. doi: 10.1016/j.jecp.2014.05.008

Nieto, Sonia. (2000). *Affirming diversity: The sociopolitical context of multicultural education* (3rd ed.). New York, NY: Longman.

Nigg, Joel T. & Barkley, Russell A. (2014). Attention-deficit/hyperactivity disorder. In Eric J. Mash & Russell A. Barkley (Eds.), *Child psychopathology* (3rd ed., pp. 75–144). New York, NY: Guilford Press.

Nugent, J. Kevin; Petrauskas, Bonnie J. & Brazelton, T. Berry (Eds.). (2009). *The newborn as a person: Enabling healthy infant development worldwide*. Hoboken, NJ: Wiley.

O'Brien, Beth A.; Wolf, Maryanne & Lovett, Maureen W. (2012). A taxometric investigation of developmental dyslexia subtypes. *Dyslexia, 18*(1), 16–39. doi: 10.1002/dys.1431

O'Doherty, Kieran. (2006). Risk communication in genetic counselling: A discursive approach to probability. *Theory & Psychology, 16*(2), 225–256. doi: 10.1177/0959354306062537

O'Leary, Colleen M.; Nassar, Natasha; Zubrick, Stephen R.; Kurinczuk, Jennifer J.; Stanley, Fiona & Bower, Carol. (2010). Evidence of a complex association between dose, pattern and timing of prenatal alcohol exposure and child behaviour problems. *Addiction, 105*(1), 74–86. doi: 10.1111/j.1360-0443.2009.02756.x

O'Conner, Rosemarie; Abedi, Jamal & Tung, Stephanie. (2012). *A descriptive analysis of enrollment and achievement among English language learner students in Pennsylvania*. Washington, DC: U.S. Department of Education, Institute of Education Sciences, National Center for Education Evaluation and Regional Assistance, Regional Educational Laboratory Mid-Atlantic.

Oakes, Lisa M.; Cashon, Cara; Casasola, Marianella & Rakison, David (Eds.). (2011). *Infant perception and cognition: Recent advances, emerging theories, and future directions*. New York, NY: Oxford University Press. doi: 10.1093/acprof:oso/9780195366709.001.0001

Obradovic, Jelena. 2012. How can the study of physiological reactivity contribute to our understanding of adversity and resilience processes in development? *Development and Psychopathology, 24*(2), 371–387. doi: 10.1017/S0954579412000053

Obradović, Jelena; Long, Jeffrey D.; Cutuli, J. J.; Chan, Chi-Keung; Hinz, Elizabeth; Heistad, David & Masten, Ann S. 2009. Academic achievement of homeless and highly mobile children in an urban school district: Longitudinal evidence on risk, growth, and resilience. *Development and Psychopathology, 21*(2), 493–518. doi: 10.1017/S0954579409000273

Offit, Paul A. 2011. *Deadly Choices: How the anti-vaccine movement threatens us all.* New York, NY: Basic Books.

Ogden, Cynthia L.; Carroll, Margaret D.; Kit, Brian K. & Flegal, Katherine M. 2014. Prevalence of childhood and adult obesity in the United States, 2011–2012. *JAMA, 311*(8), 806–814. doi: 10.1001/jama.2014.732

Ogden, Cynthia L.; Gorber, Sarah C.; Dommarco, Juan A. Rivera; Carroll, Margaret; Shields, Margot & Flegal, Katherine. 2011. The epidemiology of childhood obesity in Canada, Mexico and the United States. In Luis A. Moreno, et al. (Eds.), *Epidemiology of obesity in children and adolescents* (Vol. 2, pp. 69–93). New York, NY: Springer. doi: 10.1007/978-1-4419-6039-9_5

Oh, Seungmi & Lewis, Charlie. 2008. Korean preschoolers' advanced inhibitory control and its relation to other executive skills and mental state understanding. *Child Development, 79*(1), 80–99. doi: 10.1111/j.1467-8624.2007.01112.x

Olds, David L. (2006). The nurse–family partnership: An evidence-based preventive intervention. *Infant Mental Health Journal, 27*(1), 5–25. doi: 10.1002/imhj.20077

Olfson, Mark; Crystal, Stephen; Huang, Cecilia & Gerhard, Tobias. 2010. Trends in antipsychotic drug use by very young, privately insured children. *Journal of the American Academy of Child and Adolescent Psychiatry, 49*(1), 13–23. doi: 10.1097/00004583-201001000-00004

Olson, Kristina R. & Dweck, Carol S. 2009. Social cognitive development: A new look. *Child Development Perspectives, 3*(1), 60–65. doi: 10.1111/j.1750-8606.2008.00073.x

Olson, Sheryl L.; Lopez-Duran, Nestor; Lunkenheimer, Erika S.; Chang, Hyein & Sameroff, Arnold J. 2011. Individual differences in the development of early peer aggression: Integrating contributions of self-regulation, theory of mind, and parenting. *Development and Psychopathology, 23*(1), 253–266. doi: 10.1017/S0954579410000775

Olweus, Dan; Limber, Sue & Mahalic, Sharon F. (1999). *Bullying prevention program.* Boulder, CO: Center for the Study and Prevention of Violence, Institute of Behavioral Science, University of Colorado at Boulder.

Omariba, D. Walter Rasugu & Boyle, Michael H. 2007. Family structure and child mortality in sub-Saharan Africa: Cross-national effects of polygyny. *Journal of Marriage [illegible]*, 528–543. doi: 10.1111/j.1741-3737.2007.00388.x

Oosterman, Mirjam; Schuengel, Carlo; Slot, N. Wim; Bullens, Ruud A. R. & Doreleijers, Theo A. H. 2007. Disruptive behavior and [illegible]: A review and meta-analysis. *Clinical Child [illegible]*, 255–284. doi: 10.1177/1359104507078480

Osher, David; Bear, George G.; Sprague, Jeffrey R. & Doyle, Walter. 2010. How can we improve school discipline? *[illegible]*, 48–58.

Osorio, Snezana N. 2007. Recognizing kwashiorkor: A review for clinicians. *Nutrition in Clinical [illegible]*, 20–43. doi: 10.1097/01.NCI.0000263.82.96.6e

Ostfeld, Barbara M.; Esposito, Linda; Perl, Harold & Hegyi, Thomas. 2010. Caregiver risks in sudden infant death syndrome. *[illegible]*, 443–453. doi: 10.1[illegible]

Ostrov, Jamie M.; Kamper, Kimberly E.; Hart, Emily J.; Godleski, Stephanie A. & Blakely-McClure, Sarah J. 2014. A gender-balanced approach to the study of relational aggression and aggressive behaviors in early childhood. *Development and Psychopathology, 26*(3), 575–587. doi: 10.1017/S0954579414000248

Otheguy, Ricardo & Stern, Nancy. 2011. On so-called Spanglish. *International Journal of Bilingualism, 15*(1), 85–100. doi: 10.1177/1367006910379260

Otto, Bailey. 2014, July 11. Missouri deputy was snake bite [illegible]. *St. Louis Post-Dispatch*.

Otto, Hiltrud & Keller, Heidi (Eds.). 2014. *Different faces of attachment: [illegible]*. New York, NY: Cambridge University Press.

Over, Harriet & Gattis, Merideth. 2010. Verbal [illegible]. *[illegible]*, 10.1026/1616-3443/a000004

Ovekale, Abayomi S. & Ovekale, Tolulope O. 2009. Do mothers' [illegible] in child malnutrition and [illegible] and Niger? *The Social [illegible]*.

Ozturk, Ozge; Krehm, Madelaine & Vouloumanos, Athena. 2013. Sound symbolism in infancy: [illegible]. *Journal of Experimental Child Psychology*, 186. doi: 10.1016/j.jecp.2012.07.006

Palagi, Elisabetta. 2011. "Play" [illegible]. Modalities and potential [illegible] primates. In Anthony D. Pellegrini (Ed.), *The Oxford handbook of the [illegible]*, pp. 70–82. New York, NY: Oxford University Press. doi: 10.1093/oxfordhb/9780195393200.013.0007

Panksepp, Jaak & Watt, Douglas. 2011. What is basic about basic emotions? [illegible] sons from affective neuroscience. *[illegible]*, 387–396. doi: 10.1[illegible]

Papandreou, Maria. 2014. Communication and thinking through drawing activity in early childhood. *[illegible]*.

Park, D. J. J. & Congdon, Nathan G. 2004. [illegible]. *Archives of [illegible] Medicine: Journal of Singapore, 33*(2), 200–[illegible].

Park, Hyun; Bothe, Denise; Holsinger, Eva; Kirchner, H. Lester; Oliness, Karen & Mandalakas, Anna. 2[illegible]. *[illegible]*.

Parke, Ross D. [illegible]. *[illegible]*.

Parke, Ross D. & Buriel, Raymond. 2[illegible]. *[illegible]*.

Parker, Andrew. 2[illegible]. *[illegible]*. New York, NY: [illegible].

Parlade, Meaghan V. & Iverson, Jana M. [illegible]. *[illegible]*.

Patil, Rakesh N.; Nagaonkar, Shashikant N.; Shah, Nilesh B. & Bhat, Tushar S. 2[illegible]. *[illegible]*.

Pauler, Florian M.; Barlow, Denise P. & Hudson, Quanah J. 2012. Mechanisms of [illegible]. *[illegible]*.

Paulsell, Diane; Del Grosso, Patricia & Supplee, Lauren. 2014. Supporting [illegible]. *[illegible]*.

Paulus, Frank W.; Backes, Aline; Sander, Charlotte S.; Weber, Monika & von Gontard, Alexander. 2014. Anxiety disorders and [illegible]. *[illegible]*.

Pawlik, Amy J. & Kress, John P. 2013. [illegible]. *[illegible]*.

Pearce, Matt. 2012, November 29. Photo of NY [illegible] shows homeless.

Pedersen, Daphne E. & Kilzer, Gabe. (2014). Work-to-family conflict and the maternal gatekeeping of dual-earner mothers with young children. *Journal of Family and Economic Issues*, 35(2), 251–262. doi: 10.1007/s10834-013-9370-3

Peffley, Mark & Hurwitz, Jon. (2010). *Justice in America: The separate realities of blacks and whites*. New York, NY: Cambridge University Press.

Pelham, William E. & Fabiano, Gregory A. (2008). Evidence-based psychosocial treatments for Attention-deficit/hyperactivity disorder. *Journal of Clinical Child & Adolescent Psychology*, 37(1), 184–214. doi: 10.1080/15374410701818681

Pellegrini, Anthony D. (2011). Introduction. In Anthony D. Pellegrini (Ed.), *The Oxford handbook of the development of play* (pp. 3–6). New York, NY: Oxford University Press. doi: 10.1093/oxfordhb/9780195393002.013.0001

Pellegrini, Anthony D. (2013). Play. In Philip D. Zelazo (Ed.), *The Oxford handbook of developmental psychology* (Vol. 2, pp. 276–299). New York, NY: Oxford University Press. doi: 10.1093/oxfordhb/9780199958474.013.0012

Pellegrini, Anthony D.; Roseth, Cary J.; Van Ryzin, Mark J. & Solberg, David W. (2011). Popularity as a form of social dominance: An evolutionary perspective. In Antonius H. N. Cillessen, et al. (Eds.), *Popularity in the peer system* (pp. 123–139). New York, NY: Guilford Press.

Pellis, Sergio M. & Pellis, Vivien C. (2011). Rough-and-tumble play: Training and using the social brain. In Anthony D. Pellegrini (Ed.), *The Oxford handbook of the development of play* (pp. 245–259). New York, NY: Oxford University Press. doi: 10.1093/oxfordhb/9780195393002.013.0019

Peng, Duan & Robins, Philip K. (2010). Who should care for our kids? The effects of infant child care on early child development. *Journal of Children and Poverty*, *16*(1), 1–45. doi: 10.1080/10796120903575085

Perfetti, Jennifer; Clark, Roseanne & Fillmore, Capri-Mara. (2004). Postpartum depression: Identification, screening, and treatment. *Wisconsin Medical Journal*, *103*(6), 56–63.

Perner, Josef. (2000). Communication and representation: Why mentalistic reasoning is a lifelong endeavour. In Peter Mitchell & Kevin John Riggs (Eds.), *Children's reasoning and the mind* (pp. 367–401). Hove, UK: Psychology Press.

Persaud, Trivedi V. N.; Chudley, Albert E. & Skalko, Richard G. (1985). *Basic concepts in teratology*. New York, NY: Liss.

Persico, Antonio M. & Merelli, Sara. (2014). Environmental factors in the onset of autism spectrum disorder. *Current Developmental Disorders Reports*, *1*(1), 8–19. doi: 10.1007/s40474-013-0002-2

Peters, Stacey L.; Lind, Jennifer N.; Humphrey, Jasmine R.; Friedman, Jan M.; Honein, Margaret A.; Tassinari, Melissa S., . . . Broussard, Cheryl S. (2013). Safe lists for medications in pregnancy: Inadequate evidence base and inconsistent guidance from Web-based information, 2011. *Pharmacoepidemiology and Drug Safety*, *22*(3), 324–328. doi: 10.1002/pds.3410

Peterson, Jane W. & Sterling, Yvonne M. (2009). Children's perceptions of asthma: African American children use metaphors to make sense of asthma. *Journal of Pediatric Health Care*, *23*(2), 93–100. doi: 10.1016/j.pedhc.2007.10.002

Petrenko, Christie L. M.; Friend, Angela; Garrido, Edward F.; Taussig, Heather N. & Culhane, Sara E. (2012). Does subtype matter? Assessing the effects of maltreatment on functioning in preadolescent youth in out-of-home care. *Child Abuse & Neglect*, *36*(9), 633–644. doi: 10.1016/j.chiabu.2012.07.001

Pew Research Center. (2014, March 7). *Millennials in adulthood: Detached from institutions, networked with friends*. Washington, DC: Pew Research Center.

Peyser, James A. (2011). Unlocking the secrets of high-performing charters. *Education Next*, *11*(4), 36–43.

Phillips, Deborah A.; Fox, Nathan A. & Gunnar, Megan R. (2011). Same place, different experiences: Bringing individual differences to research in child care. *Child Development Perspectives*, *5*(1), 44–49. doi: 10.1111/j.1750-8606.2010.00155.x

Piaget, Jean. (1932). *The moral judgment of the child*. London, UK: K. Paul, Trench, Trubner & Co.

Piaget, Jean. (1952). *The origins of intelligence in children*. Oxford, UK: International Universities Press.

Piaget, Jean. (1954). *The construction of reality in the child*. New York, NY: Basic Books.

Piaget, Jean. (1962). *Play, dreams and imitation in childhood*. New York, NY: Norton.

Piaget, Jean. (1997). *The moral judgment of the child*. New York, NY: Simon & Schuster.

Piaget, Jean. (2011). *The origins of intelligence in children*. New York, NY: Routledge.

Piaget, Jean. (2013). *The moral judgment of the child*. New York, NY: Routledge.

Piaget, Jean; Voelin-Liambey, Daphne & Berthoud-Papandropoulou, Ioanna. (2001). Problems of class inclusion and logical implication. In Robert L. Campell (Ed.), *Studies in reflecting abstraction* (pp. 105–137). Hove, UK: Psychology Press.

Pickles, Andrew; Hill, Jonathan; Breen, Gerome; Quinn, John; Abbott, Kate; Jones, Helen & Sharp, Helen. (2013). Evidence for interplay between genes and parenting on infant temperament in the first year of life: Monoamine oxidase A polymorphism moderates effects of maternal sensitivity on infant anger proneness. *Journal of Child Psychology and Psychiatry*, *54*(12), 1308–1317. doi: 10.1111/jcpp.12081

Pietrantonio, Anna Marie; Wright, Elise; Gibson, Kathleen N.; Alldred, Tracy; Jacobson, Dustin & Niec, Anne. (2013). Mandatory reporting of child abuse and neglect: Crafting a positive process for health professionals and caregivers. *Child Abuse & Neglect*, 37(2/3), 102–109. doi: 10.1016/j.chiabu.2012.12.007

Pilarz, Alejandra Ros & Hill, Heather D. (2014). Unstable and multiple child care arrangements and young children's behavior. *Early Childhood Research Quarterly*, *29*(4), 471–483. doi: 10.1016/j.ecresq.2014.05.007

Pin, Tamis; Eldridge, Beverley & Galea, Mary P. (2007). A review of the effects of sleep position, play position, and equipment use on motor development in infants. *Developmental Medicine & Child Neurology*, *49*(11), 858–867. doi: 10.1111/j.1469-8749.2007.00858.x

Pinker, Steven. (2007). *The stuff of thought: Language as a window into human nature*. New York, NY: Viking.

Pinker, Steven. (2011). *The better angels of our nature: Why violence has declined*. New York, NY: Viking.

PISA. (2014b). *PISA 2012 results in focus: What 15-year-olds know and what they can do with what they know*. Paris, France: OECD.

Piteo, A. M.; Roberts, R. M.; Nettelbeck, T.; Burns, N.; Lushington, K.; Martin, A. J. & Kennedy, J. D. (2013). Postnatal depression mediates the relationship between infant and maternal sleep disruption and family dysfunction. *Early Human Development*, *89*(2), 69–74. doi: 10.1016/j.earlhumdev.2012.07.017

Plomin, Robert; DeFries, John C.; Knopik, Valerie S. & Neiderhiser, Jenae M. (2013). *Behavioral genetics*. New York, NY: Worth Publishers.

Plows, Alexandra. (2011). *Debating human genetics: Contemporary issues in public policy and ethics*. New York, NY: Routledge.

Pluess, Michael & Belsky, Jay. (2010). Differential susceptibility to parenting and quality child care. *Developmental Psychology*, *46*(2), 379–390. doi: 10.1037/a0015203

Pogrebin, Abigail. (2010). *One and the same: My life as an identical twin and what I've learned about everyone's struggle to be singular*. New York, NY: Anchor.

Portnoy, Jill; Gao, Yu; Glenn, Andrea L.; Niv, Sharon; Peskin, Melissa; Rudo-Hutt, Anna, . . . Raine, Adrian. (2013). The biology of childhood crime and antisocial behavior. In Chris L. Gibson & Marvin D. Krohn (Eds.), *Handbook of life-course criminology: Emerging trends and directions for future research* (pp. 21–42). New York, NY: Springer. doi: 10.1007/978-1-4614-5113-6_2

Posner, Michael I.; Rothbart, Mary K.; Sheese, Brad E. & Tang, Yiyuan. (2007). The anterior cingulate gyrus and the mechanism of self-regulation. *Cognitive, Affective & Behavioral Neuroscience*, *7*(4), 391–395. doi: 10.3758/CABN.7.4.391

Powell, Cynthia M. (2013). Sex chromosomes, sex chromosome disorders, and disorders of sex development. In Steven L. Gersen & Martha B. Keagle (Eds.), *The principles of clinical cytogenetics* (pp. 175–211). New York, NY: Springer. doi: 10.1007/978-1-4419-1688-4_10

Powell, Shaun; Langlands, Stephanie & Dodd, Chris. (2011). Feeding children's desires? Child and parental perceptions of food promotion to the "under 8s". *Young Consumers: Insight and Ideas for Responsible Marketers, 12*(2), 96–109. doi: 10.1108/17473611111141560

Pozzoli, Tiziana & Gini, Gianluca. (2013). Why do bystanders of bullying help or not? A multidimensional model. *The Journal of Early Adolescence, 33*(3), 315–340. doi: 10.1177/0272431612440172

Proctor, Laura J. & Dubowitz, Howard. (2014). Child neglect: Challenges and controversies. In Jill E. Korbin & Richard D. Krugman (Eds.), *Handbook of child maltreatment* (pp. 27–61). New York, NY: Springer. doi: 10.1007/978-94-007-7208-3_2

Propper, Cathi B. & Holochwost, Steven J. (2013). The influence of proximal risk on the early development of the autonomic nervous system. *Developmental Review, 33*(3), 151–167. doi: 10.1016/j.dr.2013.05.001

Provasnik, Stephen; Kastberg, David; Ferraro, David; Lemanski, Nita; Roey, Stephen & Jenkins, Frank. (2012). *Highlights from TIMSS 2011: Mathematics and science achievement of U.S. fourth- and eighth-grade students in an international context*. Washington, DC: National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education.

Pruden, Shannon M.; Hirsh-Pasek, Kathy; Golinkoff, Roberta M. & Hennon, Elizabeth A. (2006). The birth of words: Ten-month-olds learn words through perceptual salience. *Child Development, 77*(2), 266–280. doi: 10.1111/j.1467-8624.2006.00869.x

Pryor, Frederic L. (2014). A note on the determinants of recent pupil achievement. *Scientific Research, 5*, 1265–1268. doi: 10.4236/ce.2014.514143

Pulvermüller, Friedemann & Fadiga, Luciano. (2010). Active perception: Sensorimotor circuits as a cortical basis for language. *Nature Reviews Neuroscience, 11*(5), 351–360. doi: 10.1038/nrn2811

Puri, Sunita; Adams, Vincanne; Ivey, Susan & Nachtigall, Robert D. (2011). "There is such a thing as too many daughters, but not too many sons": A qualitative study of son preference and fetal sex selection among Indian immigrants in the United States. *Social Science & Medicine, 72*(7), 1169–1176. doi: 10.1016/j.socscimed.2011.01.027

Purves, Dale; Augustine, George J.; Fitzpatrick, David; Hall, William C.; LaMantia, Anthony-Samuel; McNamara, James O. & Williams, S. Mark (Eds.). (2004). *Neuroscience* (3rd ed.). Sunderland, MA: Sinauer Associates.

Putnam, Richard R. (2011). First comes marriage, then comes divorce: A perspective on the process. *Journal of Divorce & Remarriage, 52*(7), 557–564. doi: 10.1080/10502556.2011.615661

Qin, Desiree B. & Chang, Tzu-Fen. (2013). Asian fathers. In Natasha J. Cabrera & Catherine S. Tamis-LeMonda (Eds.), *Handbook of father involvement: Multidisciplinary perspectives* (2nd ed., pp. 261–281). New York, NY: Routledge.

Rabin, Roni C. (2011, October 25). Drugs to treat A.D.H.D. reach the preschool set. *The New York Times*, p. D5.

Rabipour, Sheida & Raz, Amir. (2012). Training the brain: Fact and fad in cognitive and behavioral remediation. *Brain and Cognition, 79*(2), 159–179. doi: 10.1016/j.bandc.2012.02.006

Rabkin, Nick & Hedberg, Eric C. (2011). *Arts education in America: What the declines mean for arts participation*. Washington, DC: National Endowment for the Arts.

Race Ethnicity and Genetics Working Group. (2005). The use of racial, ethnic, and ancestral categories in human genetics research. *American Journal of Human Genetics, 77*(4), 519–532. doi: 10.1086/491747

Raeburn, Paul. (2014). *Do fathers matter?: What science is telling us about the parent we've overlooked*. New York, NY: Farrar, Straus and Giroux.

Rajaratnam, Julie Knoll; Marcus, Jake R.; Flaxman, Abraham D.; Wang, Haidong; Levin-Rector, Alison; Dwyer, Laura, . . . Murray, Christopher J. L. (2010). Neonatal, postneonatal, childhood, and under-5 mortality for 187 countries, 1970–2010: A systematic analysis of progress towards Millennium Development Goal 4. *The Lancet, 375*(9730), 1988–2008. doi: 10.1016/S0140-6736(10)60703-9

Ramakrishnan, Usha; Goldenberg, Tamar & Allen, Lindsay H. (2011). Do multiple micronutrient interventions improve child health, growth, and development? *Journal of Nutrition, 141*(11), 2066–2075. doi: 10.3945/jn.111.146845

Ramani, Geetha B.; Brownell, Celia A. & Campbell, Susan B. (2010). Positive and negative peer interaction in 3- and 4-year-olds in relation to regulation and dysregulation. *Journal of Genetic Psychology, 171*(3), 218–250. doi: 10.1080/00221320903300353

Ramscar, Michael & Dye, Melody. (2011). Learning language from the input: Why innate constraints can't explain noun compounding. *Cognitive Psychology, 62*(1), 1–40. doi: 10.1016/j.cogpsych.2010.10.001

Ramscar, Michael; Dye, Melody; Gustafson, Jessica W. & Klein, Joseph. (2013). Dual routes to cognitive flexibility: Learning and response-conflict resolution in the dimensional change card sort task. *Child Development, 84*(4), 1308–1323. doi: 10.1111/cdev.12044

Rasinger, Sebastian M. (2013). Language shift and vitality perceptions amongst London's second-generation Bangladeshis. *Journal of Multilingual and Multicultural Development, 34*(1), 46–60. doi: 10.1080/01434632.2012.707202

Raspberry, Kelly A. & Skinner, Debra. (2011). Negotiating desires and options: How mothers who carry the fragile X gene experience reproductive decisions. *Social Science & Medicine, 72*(6), 992–998. doi: 10.1016/j.socscimed.2011.01.010

Ratnarajah, Nagulan; Rifkin-Graboi, Anne; Fortier, Marielle V.; Chong, Yap Seng; Kwek, Kenneth; Saw, Seang-Mei, . . . Qiu, Anqi. (2013). Structural connectivity asymmetry in the neonatal brain. *NeuroImage, 75*, 187–194. doi: 10.1016/j.neuroimage.2013.02.052

Ravizza, Kenneth. (2007). Peak experiences in sport. In Daniel Smith & Michael Bar-Eli (Eds.), *Essential readings in sport and exercise psychology* (pp. 122–125). Champaign, IL: Human Kinetics.

Ray, Brian D. (2013). Homeschooling rising into the twenty-first century: Editor's introduction. *Peabody Journal of Education, 88*(3), 261–264. doi: 10.1080/0161956X.2013.796822

Raymond, Neil; Beer, Charlotte; Glazebrook, Cristine & Sayal, Kapil. (2009). Pregnant women's attitudes towards alcohol consumption. *BMC Public Health, 9*(1), 175–183. doi: 10.1186/1471-2458-9-175

Reavey, Daphne; Haney, Barbara M.; Atchison, Linda; Anderson, Betsi; Sandritter, Tracy & Pallotto, Eugenia K. (2014). Improving pain assessment in the NICU: A quality improvement project. *Advances in Neonatal Care, 14*(3), 144–153. doi: 10.1097/ANC.0000000000000034

Reche, Marta; Valbuena, Teresa; Fiandor, Ana; Padial, Antonia; Quirce, Santiago & Pascual, Cristina. (2011). Induction of tolerance in children with food allergy. *Current Nutrition & Food Science, 7*(1), 33–39. doi: 10.2174/157340111794941085

Reddy, Marpadga A. & Natarajan, Rama. (2013). Role of epigenetic mechanisms in the vascular complications of diabetes. In Tapas K. Kundu (Ed.), *Epigenetics: Development and disease* (pp. 435–454). New York, NY: Springer. doi: 10.1007/978-94-007-4525-4_19

Rendell, Luke; Fogarty, Laurel; Hoppitt, William J. E.; Morgan, Thomas J. H.; Webster, Mike M. & Laland, Kevin N. (2011). Cognitive culture: Theoretical and empirical insights into social learning strategies. *Trends in Cognitive Sciences, 15*(2), 68–76. doi: 10.1016/j.tics.2010.12.002

Reynolds, Arthur J. (2000). *Success in early intervention: The Chicago child-parent centers*. Lincoln, NE: University of Nebraska Press.

Reynolds, Arthur J. & Ou, Suh-Ruu. (2011). Paths of effects from preschool to adult well-being: A confirmatory analysis of the child-parent center program. *Child Development, 82*(2), 555–582. doi: 10.1111/j.1467-8624.2010.01562.x

Reynolds, Arthur J.; Temple, Judy A.; White, Barry A. B.; Ou, Suh-Ruu & Robertson, Dylan L. (2011). Age 26 cost–benefit analysis of the child-parent center early education program. *Child Development, 82*(1), 379–404. doi: 10.1111/j.1467-8624.2010.01563.x

Rhodes, Marjorie. (2013). The conceptual structure of social categories: The social allegiance hypothesis. In Mahzarin R. Banaji & Susan A. Gelman (Eds.), *Navigating the social world: What infants, children, and other species can teach us* (pp. 258–262). New York, NY: Oxford University Press.

Riccio, Cynthia A. & Rodriguez, Olga L. (2007). Integration of psychological assessment

approaches in school psychology. *Psychology in the Schools, 44*(3), 243–255. doi: 10.1002/pits.20220

Richards, Jennifer S.; Hartman, Catharina A.; Franke, Barbara; Hoekstra, Pieter J.; Heslenfeld, Dirk J.; Oosterlaan, Jaap, . . . Buitelaar, Jan K. (2014). Differential susceptibility to maternal expressed emotion in children with ADHD and their siblings? Investigating plasticity genes, prosocial and antisocial behaviour. *European Child & Adolescent Psychiatry*. doi: 10.1007/s00787-014-0567-2

Richardson, Rick & Hayne, Harlene. (2007). You can't take it with you: The translation of memory across development. *Current Directions in Psychological Science, 16*(4), 223–227. doi: 10.1111/j.1467-8721.2007.00508.x

Richert, Rebekah A.; Robb, Michael B. & Smith, Erin I. (2011). Media as social partners: The social nature of young children's learning from screen media. *Child Development, 82*(1), 82–95. doi: 10.1111/j.1467-8624.2010.01542.x

Riordan, Jan & Wambach, Karen (Eds.). (2009). *Breastfeeding and human lactation* (4th ed.). Sudbury, MA: Jones and Bartlett Publishers.

Robelen, Erik W. (2011). More students enrolling in Mandarin Chinese. *Education Week, 30*(27), 5.

Roberts, Leslie. (2013). The art of eradicating polio. *Science, 342*(6154), 28–35. doi: 10.1126/science.342.6154.28

Robins, Richard W.; Trzesniewski, Kali H. & Donnellan, M. Brent. (2012). A brief primer on self-esteem. *Prevention Researcher, 19*(2), 3–7.

Robinson, Leah E.; Wadsworth, Danielle D.; Webster, E. Kipling & Bassett, David R. (2014). School reform: The role of physical education policy in physical activity of elementary school children in Alabama's Black Belt region. *American Journal of Health Promotion, 38*(sp3), S72–S76. doi: 10.4278/ajhp.130430-ARB-207

Rochat, Philippe. (2013). Self-conceptualizing in development. In Philip D. Zelazo (Ed.), *The Oxford handbook of developmental psychology* (Vol. 2, pp. 378–397). New York, NY: Oxford University Press. doi: 10.1093/oxfordhb/9780199958474.013.0015

Roebers, Claudia M.; Schmid, Corinne & Roderer, Thomas. (2009). Metacognitive monitoring and control processes involved in primary school children's test performance. *British Journal of Educational Psychology*, 79(4), 749–767. doi: 10.1348/978185409X429842

Rogers, Carl R. (2004). *On becoming a person: A therapist's view of psychotherapy*. London, UK: Constable.

Rogers-Chapman, M. Felicity. (2013). Accessing STEM-focused education: Factors that contribute to the opportunity to attend STEM high schools across the United States. *Education and Urban Society, 46*(6), 716–737. doi: 10.1177/0013124512469815

Rogoff, Barbara. (2003). *The cultural nature of human development*. New York, NY: Oxford University Press.

Rogoff, Barbara. (2011). *Developing destinies: A Mayan midwife and town*. New York, NY: Oxford University Press.

Rojas, Raúl & Iglesias, Aquiles. (2013). The language growth of Spanish-speaking English Language Learners. *Child Development, 84*(2), 2630–2646. doi: 10.1111/j.1467-8624.2012.01871.x

Rondal, Jean A. (2010). Language in Down syndrome: A life-span perspective. In Marcia A. Barnes (Ed.), *Genes, brain, and development: The neurocognition of genetic disorders* (pp. 122–142). New York, NY: Cambridge University Press.

Rook, Graham A. W.; Lowry, Christopher A. & Raison, Charles L. (2014). Hygiene and other early childhood influences on the subsequent function of the immune system. *Brain Research*(Corrected Proof). doi: 10.1016/j.brainres.2014.04.004

Roopnarine, Jaipaul L. (2011). Cultural variations in beliefs about play, parent-child play, and children's play: Meaning for childhood development. In Anthony D. Pellegrini (Ed.), *The Oxford handbook of the development of play* (pp. 19–39). New York, NY: Oxford University Press. doi: 10.1093/oxfordhb/9780195393002.013.0003

Roopnarine, Jaipaul L. & Hossain, Ziarat. (2013). African American and African Caribbean fathers. In Natasha J. Cabrera & Catherine S. Tamis-LeMonda (Eds.), *Handbook of father involvement: Multidisciplinary perspectives* (2nd ed., pp. 223–243). New York, NY: Routledge.

Rose, Steven. (2008). Drugging unruly children is a method of social control. *Nature, 451*(7178), 521. doi: 10.1038/451521a

Roseberry, Sarah; Hirsh-Pasek, Kathy; Parish-Morris, Julia & Golinkoff, Roberta M. (2009). Live action: Can young children learn verbs from video? *Child Development, 80*(5), 1360–1375. doi: 10.1111/j.1467-8624.2009.01338.x

Rosin, Hanna. (2014, March 19). The overprotected kid. *The Atlantic*.

Rossignol, Michel; Chaillet, Nils; Boughrassa, Faiza & Moutquin, Jean-Marie. (2014). Interrelations between four antepartum obstetric interventions and cesarean delivery in women at low risk: A systematic review and modeling of the cascade of interventions. *Birth, 41*(1), 70–78. doi: 10.1111/birt.12088

Rotatori, Anthony; Bakken, Jeffrey P.; Burkhardt, Sandra A.; Obiakor, Festus E. & Sharma, Umesh. (2014). *Special education international perspectives: Practices across the globe*. Bingley, UK: Emerald.

Roth, Guy & Assor, Avi. (2012). The costs of parental pressure to express emotions: Conditional regard and autonomy support as predictors of emotion regulation and intimacy. *Journal of Adolescence, 35*(4), 799–808. doi: 10.1016/j.adolescence.2011.11.005

Rothrauff, Tanja C.; Cooney, Teresa M. & An, Jeong Shin. (2009). Remembered parenting styles and adjustment in middle and late adulthood. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences, 64B*(1), 137–146. doi: 10.1093/geronb/gbn008

Rottenberg, Jonathan. (2014). *The depths: The evolutionary origins of the depression epidemic*. New York, NY: Basic Books.

Rouchka, Eric C. & Cha, I. Elizabeth. (2009). Current trends in pseudogene detection and characterization. *Current Bioinformatics, 4*(2), 112–119. doi: 10.2174/157489309788184792

Rovee-Collier, Carolyn. (1987). Learning and memory in infancy. In Joy Doniger Osofsky (Ed.), *Handbook of infant development* (2nd ed., pp. 98–148). New York, NY: Wiley.

Rovee-Collier, Carolyn. (1990). The "memory system" of prelinguistic infants. *Annals of the New York Academy of Sciences, 608*, 517–542. doi: 10.1111/j.1749-6632.1990.tb48908.x

Rovee-Collier, Carolyn & Cuevas, Kimberly. (2009). The development of infant memory. In Mary L. Courage & Nelson Cowan (Eds.), *The development of memory in infancy and childhood* (2nd ed., pp. 11–41). New York, NY: Psychology Press.

Rovee-Collier, Carolyn & Hayne, Harlene. (1987). Reactivation of infant memory: Implications for cognitive development. In Hayne W. Reese (Ed.), *Advances in child development and behavior* (Vol. 20, pp. 185–238). London, UK: Academic Press.

Rubertsson, C.; Hellström, J.; Cross, M. & Sydsjö, G. (2014). Anxiety in early pregnancy: Prevalence and contributing factors. *Archives of Women's Mental Health, 17*(3), 221–228. doi: 10.1007/s00737-013-0409-0

Rubin, Kenneth H.; Bowker, Julie C.; McDonald, Kristina L. & Menzer, Melissa. (2013). Peer relationships in childhood. In Philip D. Zelazo (Ed.), *The Oxford handbook of developmental psychology* (Vol. 2, pp. 242–275). New York, NY: Oxford University Press. doi: 10.1093/oxfordhb/9780199958474.013.0011

Rubin, Kenneth H.; Coplan, Robert J. & Bowker, Julie C. (2009). Social withdrawal in childhood. *Annual Review of Psychology, 60*, 141–171. doi: 10.1146/annurev.psych.60.110707.163642

Ruble, Diane N.; Martin, Carol Lynn & Berenbaum, Sheri. (2006). Gender development. In William Damon & Richard M. Lerner (Eds.), *Handbook of child psychology* (6th ed., Vol. 3, pp. 858–932). Hoboken, NJ: Wiley.

Runions, Kevin C. & Shaw, Thérèse. (2013). Teacher–child relationship, child withdrawal and aggression in the development of peer victimization. *Journal of Applied Developmental Psychology, 34*(6), 319–327. doi: 10.1016/j.appdev.2013.09.002

Russell, Charlotte K.; Robinson, Lyn & Ball, Helen L. (2013). Infant sleep development: Location, feeding and expectations in the postnatal period. *The Open Sleep Journal, 6*(1), 68–76. doi: 10.2174/1874620901306010068

Russo, Theresa J. & Fallon, Moira A. (2014). Coping with stress: Supporting the needs of military families and their children. *Early Childhood*

Education Journal. doi: 10.1007/s10643-014-0665-2

Rutter, Michael; Sonuga-Barke, Edmund J.; Beckett, Celia; Castle, Jennifer; Kreppner, Jana; Kumsta, Robert, . . . Gunnar, Megan R. (2010). Deprivation-specific psychological patterns: Effects of institutional deprivation. *Monographs of the Society for Research in Child Development*, 75(1). doi: 10.1111/j.1540-5834.2010.00547.x

Ryan, Alan S. (1997). The resurgence of breastfeeding in the United States. *Pediatrics*, 99(4), E12

Ryan, Alan S.; Rush, David; Krieger, Fritz W. & Lewandowski, Gregory E. (1991). Recent declines in breast-feeding in the United States, 1984 through 1989. *Pediatrics*, 88(4), 719–727.

Ryan, Alan S.; Zhou, Wenjun & Acosta, Andrew. (2002). Breastfeeding continues to increase into the new millennium. *Pediatrics*, *110*(6), 1103–1109. doi: 10.1542/peds.110.6.1103

Ryan, Erin L. (2012). "They are kind of like magic": Why U.S. mothers use baby videos with 12- to 24-month-olds. *Journalism and Mass Communication*, 2(7), 771–785.

Rymer, Russ. (1994). *Genie: A scientific tragedy*. New York: Harper Perennial.

Saarni, Carolyn; Campos, Joseph J.; Camras, Linda A. & Witherington, David. (2006). Emotional development: Action, communication, and understanding. In William Damon & Richard M. Lerner (Eds.), *Handbook of child psychology* (6th ed., Vol. 3, pp. 226–299). Hoboken, NJ: Wiley.

Sabol, T. J.; Soliday Hong, S. L.; Pianta, R. C. & Burchinal, M. R. (2013). Can rating Pre-K programs predict children's learning? *Science*, *341*(6148), 845–846. doi: 10.1126/science.1233517

Sacks, Oliver W. (1995). *An anthropologist on Mars: Seven paradoxical tales*. New York, NY: Knopf.

Sadeh, Avi; Mindell, Jodi A.; Luedtke, Kathryn & Wiegand, Benjamin. (2009). Sleep and sleep ecology in the first 3 years: A web-based study. *Journal of Sleep Research*, *18*(1), 60–73. doi: 10.1111/j.1365-2869.2008.00699.x

Sadeh, Avi; Tikotzky, Liat & Scher, Anat. (2010). Parenting and infant sleep. *Sleep Medicine Reviews*, *14*(2), 89–96. doi: 10.1016/j.smrv.2009.05.003

Sadler, Thomas W. (2012). *Langman's medical embryology* (12th ed.). Philadelphia, PA: Lippincott Williams & Wilkins.

Saffran, Jenny R.; Werker, Janet F. & Werner, Lynne A. (2006). The infant's auditory world: Hearing, speech, and the beginnings of language. In William Damon & Richard M. Lerner (Eds.), *Handbook of child psychology* (6th ed., Vol. 2, pp. 58–108). Hoboken, NJ: Wiley.

Sagarin, Brad J.; Martin, Amy L.; Coutinho, Savia A.; Edlund, John E.; Patel, Lily; Skowronski, John J. & Zengel, Bettina. (2012). Sex differences in jealousy: A meta-analytic examination. *Evolution and Human Behavior*, 33(6), 595–614. doi: 10.1016/j.evolhumbehav.2012.02.006

Sahlberg, Pasi. (2011). *Finnish lessons: What can the world learn from educational change in Finland?* New York, NY: Teachers College Press.

Salkind, Neil J. (2004). *An introduction to theories of human development*. Thousand Oaks, CA: Sage.

Salmivalli, Christina. (2010). Bullying and the peer group: A review. *Aggression and Violent Behavior*, *15*(2), 112–120. doi: 10.1016/j.avb.2009.08.007

Samek, D. R.; Hicks, B. M.; Keyes, M. A.; Bailey, J.; McGue, M. & Iacono, W. G. (2014). Gene environment interplay between parent-child relationship problems and externalizing disorders in adolescence and young adulthood. *Psychological Medicine*. doi: 10.1017/S0033291714001445

Samuels, Christina A. & Klein, Alyson. (2013). States faulted on preschool spending levels. *Education Week*, 32(30), 21, 24.

Sanson, Ann; Smart, Diana & Misson, Sebastian. (2011). Children's socio-emotional, physical, and cognitive outcomes: Do they share the same drivers? *Australian Journal of Psychology*, *63*(1), 56–74. doi: 10.1111/j.1742-9536.2011.00007.x

Saraiva, Linda; Rodrigues, Luís P.; Cordovil, Rita & Barreiros, João. (2013). Influence of age, sex and somatic variables on the motor performance of pre-school children. *Annals of Human Biology*, *40*(5), 444–450. doi: 10.3109/03014460.2013.802012

Saw, Seang-Mei; Cheng, Angela; Fong, Allan; Gazzard, Gus; Tan, Donald T. H. & Morgan, Ian. (2007). School grades and myopia. *Ophthalmic and Physiological Optics*, 27(2), 126–129. doi: 10.1111/j.1475-1313.2006.00455.x

Saxton, Matthew. (2010). *Child language: Acquisition and development*. Thousand Oaks, CA: Sage.

Scarr, Sandra. (1985). Constructing psychology: Making facts and fables for our times. *American Psychologist*, *40*(5), 499–512. doi: 10.1037/0003-066x.40.5.499

Schachner, Adena & Hannon, Erin E. (2011). Infant-directed speech drives social preferences in 5-month-old infants. *Developmental Psychology*, *47*(1), 19–25. doi: 10.1037/a0020740

Schafer, Markus H.; Morton, Patricia M. & Ferraro, Kenneth F. (2014). Child maltreatment and adult health in a national sample: Heterogeneous relational contexts, divergent effects? *Child Abuse & Neglect*, 38(3), 395–406. doi: 10.1016/j.chiabu.2013.08.003

Schanler, Richard. J. (2011). Outcomes of human milk-fed premature infants. *Seminars in Perinatology*, 35(1), 29–33. doi: 10.1053/j.semperi.2010.10.005

Schardein, James L. (1976). *Drugs as teratogens*. Cleveland, OH: CRC Press.

Scheffler, Richard M.; Brown, Timothy T.; Fulton, Brent D.; Hinshaw, Stephen P.; Levine, Peter & Stone, Susan. (2009). Positive association between Attention-deficit/hyperactivity disorder medication use and academic achievement during elementary school. *Pediatrics*, *123*(5), 1273–1279. doi: 10.1542/peds.2008-1597

Schermerhorn, Alice C.; D'Onofrio, Brian M.; Turkheimer, Eric; Ganiban, Jody M.; Spotts, Erica L.; Lichtenstein, Paul, . . . Neiderhiser, Jenae M. (2011). A genetically informed study of associations between family functioning and child psychosocial adjustment. *Developmental Psychology*, 47(3), 707–725. doi: 10.1037/a0021362

Schifrin, Barry S. & Cohen, Wayne R. (2013). The effect of malpractice claims on the use of caesarean section. *Best Practice & Research Clinical Obstetrics & Gynaecology*, 27(2), 269–283. doi: 10.1016/j.bpobgyn.2012.10.004

Schmid, Monika S.; Gilbers, Steven & Nota, Amber. (2014). Ultimate attainment in late second language acquisition: Phonetic and grammatical challenges in advanced Dutch-English bilingualism. *Second Language Research*, 30(2), 129–157. doi: 10.1177/0267658313505314

Schneider, Wolfgang & Lockl, Kathrin. (2008). Procedural metacognition in children: Evidence for developmental trends. In John Dunlosky & Robert A. Bjork (Eds.), *Handbook of metamemory and memory* (pp. 391–409). New York, NY: Psychology Press.

Schofield, Thomas J.; Martin, Monica J.; Conger, Katherine J.; Neppl, Tricia M.; Donnellan, M. Brent & Conger, Rand D. (2011). Intergenerational transmission of adaptive functioning: A test of the interactionist model of SES and human development. *Child Development*, *82*(1), 33–47. doi: 10.1111/j.1467-8624.2010.01539.x

Schön, Daniele; Boyer, Maud; Moreno, Sylvain; Besson, Mireille; Peretz, Isabelle & Kolinsky, Régine. (2008). Songs as an aid for language acquisition. *Cognition*, *106*(2), 975–983. doi: 10.1016/j.cognition.2007.03.005

Schore, Allan & McIntosh, Jennifer. (2011). Family law and the neuroscience of attachment, part I. *Family Court Review*, 49(3), 501–512. doi: 10.1111/j.1744-1617.2011.01387.x

Schwartz, Carl E.; Kunwar, Pratap S.; Greve, Douglas N.; Moran, Lyndsey R.; Viner, Jane C.; Covino, Jennifer M., . . . Wallace, Stuart R. (2010). Structural differences in adult orbital and ventromedial prefrontal cortex predicted by infant temperament at 4 months of age. *Archives of General Psychiatry*, 67(1), 78–84. doi: 10.1001/archgenpsychiatry.2009.171

Schwarz, Alan & Cohen, Sarah. (2013, March 31). A.D.H.D. seen in 11% of U.S. children as diagnoses rise. *The New York Times*.

Schweinhart, Lawrence J.; Montie, Jeanne; Xiang, Zongping; Barnett, W. Steven; Belfield, Clive R. & Nores, Milagros. (2005). *Lifetime effects: The High/Scope Perry Preschool Study through age 40*. Ypsilanti, MI: High/Scope Press.

Schweinhart, Lawrence J. & Weikart, David P. (1997). *Lasting differences: The High/Scope Preschool curriculum comparison study through age 23*. Ypsilanti, MI: High/Scope Educational Research Foundation.

Schytt, Erica & Waldenström, Ulla. (2010). Epidural analgesia for labor pain: Whose choice? *Acta Obstetricia et Gynecologica Scandinavica*, *89*(2), 238–242. doi: 10.3109/00016340903280974

Scott, Diane L.; Lee, Chang-Bae; Harrell, Susan W. & Smith-West, Mary B. (2013). Permanency for children in foster care: Issues and barriers for adoption. *Child & Youth Services*, *34*(3), 290–307. doi: 10.1080/0145935X.2013.826045

Scott, Lisa S. & Monesson, Alexandra. (2010). Experience-dependent neural specialization during infancy. *Neuropsychologia*, *48*(6), 1857–1861. doi: 10.1016/j.neuropsychologia.2010.02.008

Scott, Lisa S.; Pascalis, Olivier & Nelson, Charles A. (2007). A domain-general theory of the development of perceptual discrimination. *Current Directions in Psychological Science*, *16*(4), 197–201. doi: 10.1111/j.1467-8721.2007.00503.x

Sear, Rebecca & Mace, Ruth. (2008). Who keeps children alive? A review of the effects of kin on child survival. *Evolution and Human Behavior*, *29*(1), 1–18. doi: 10.1016/j.evolhumbehav.2007.10.001

Sebastián-Gallés, Núria. (2007). Biased to learn language. *Developmental Science*, *10*(6), 713–718. doi: 10.1111/j.1467-7687.2007.00649.x

Sedlak, Andrea J. & Ellis, Raquel T. (2014). Trends in child abuse reporting. In Jill E. Korbin & Richard D. Krugman (Eds.), *Handbook of child maltreatment* (pp. 3–26). New York, NY: Springer. doi: 10.1007/978-94-007-7208-3_1

Séguin, Jean R. & Tremblay, Richard E. (2013). Aggression and antisocial behavior: A developmental perspective. In Philip D. Zelazo (Ed.), *The Oxford handbook of developmental psychology* (Vol. 2, pp. 507–526). New York, NY: Oxford University Press. doi: 10.1093/oxfordhb/9780199958474.013.0020

Seifer, Ronald; Dickstein, Susan; Parade, Stephanie; Hayden, Lisa C.; Magee, Karin D. & Schiller, Masha. (2014). Mothers' appraisal of goodness of fit and children's social development. *International Journal of Behavioral Development*, *38*(1), 86–97. doi: 10.1177/0165025413507172

Seiver, Elizabeth; Gopnik, Alison & Goodman, Noah D. (2013). Did she jump because she was the big sister or because the trampoline was safe? Causal inference and the development of social attribution. *Child Development*, *84*(2), 443–454. doi: 10.1111/j.1467-8624.2012.01865.x

Seligman, Hilary K. & Schillinger, Dean. (2010). Hunger and socioeconomic disparities in chronic disease. *New England Journal of Medicine*, *363*(1), 6–9. doi: 10.1056/NEJMp1000072

Seligman, Martin E. P.; Railton, Peter; Baumeister, Roy F. & Sripada, Chandra. (2013). Navigating into the future or driven by the past. *Perspectives on Psychological Science*, *8*(2), 119–141. doi: 10.1177/1745691612474317

Seltzer, Judith A.; Yahirun, Jenjira J. & Bianchi, Suzanne M. (2013). Coresidence and geographic proximity of mothers and adult children in stepfamilies. *Journal of Marriage and Family*, *75*(5), 1164–1180. doi: 10.1111/jomf.12058

Şendil, Çağla Öneren & Erden, Feyza Tantekin. (2014). Peer preference: A way of evaluating social competence and behavioural well-being in early childhood. *Early Child Development and Care*, *184*(2), 230–246. doi: 10.1080/03004430.2013.778254

Senior, Jennifer. (2014). *All joy and no fun: The paradox of modern parenthood*. New York, NY: Ecco.

Seppa, Nathan. (2013). Urban eyes: Too much time spent indoors may be behind a surge in nearsightedness. *Science News*, *183*(3), 22–25. doi: 10.1002/scin.5591830323

Seppa, Nathan. (2014). Whooping cough bounces back: Replacement vaccine is not so great at protecting kids. *Science News*, *185*(8), 22–26. doi: 10.1002/scin.5591850817

Settle, Jaime E.; Dawes, Christopher T.; Christakis, Nicholas A. & Fowler, James H. (2010). Friendships moderate an association between a dopamine gene variant and political ideology. *The Journal of Politics*, *72*(4), 1189–1198. doi: 10.1017/S0022381610000617

Shah, Nirvi. (2011). Policy fight brews over discipline. *Education Week*, *31*(7), 1, 12.

Shah, Prakesh; Balkhair, Taiba; Ohlsson, Arne; Beyene, Joseph; Scott, Fran & Frick, Corine. (2011). Intention to become pregnant and low birth weight and preterm birth: A systematic review. *Maternal and Child Health Journal*, *15*(2), 205–216. doi: 10.1007/s10995-009-0546-2

Shahin, Hashem; Walsh, Tom; Sobe, Tama; Lynch, Eric; King, Mary-Claire; Avraham, Karen B. & Kanaan, Moien. (2002). Genetics of congenital deafness in the Palestinian population: Multiple connexin 26 alleles with shared origins in the Middle East. *Human Genetics*, *110*(3), 284–289. doi: 10.1007/s00439-001-0674-2

Shanahan, Timothy & Lonigan, Christopher J. (2010). The National Early Literacy Panel: A summary of the process and the report. *Educational Researcher*, *39*(4), 279–285. doi: 10.3102/0013189x10369172

Shanks, Laurie. (2011). Child sexual abuse: How to move to a balanced and rational approach to the cases everyone abhors. *American Journal of Trial Advocacy*, *34*(3).

Shapiro, Edward S.; Zigmond, Naomi; Wallace, Teri & Marston, Doug (Eds.). (2011). *Models for implementing response to intervention: Tools, outcomes, and implications*. New York, NY: Guilford Press.

Shapiro, Melanie F. (2011). *Mothers' feelings about physical and emotional intimacy twelve to fifteen months after the birth of a first child*. (Thesis). School for Social Work. Northampton, MA: Smith College. https://dspace.smith.edu/handle/11020/23004

Sheeran, Paschal; Harris, Peter R. & Epton, Tracy. (2014). Does heightening risk appraisals change people's intentions and behavior? A meta-analysis of experimental studies. *Psychological Bulletin*, *140*(2), 511–543. doi: 10.1037/a0033065

Shi, Bing & Xie, Hongling. (2012). Popular and nonpopular subtypes of physically aggressive preadolescents: Continuity of aggression and peer mechanisms during the transition to middle school. *Merrill-Palmer Quarterly*, *58*(4), 530–553. doi: 10.1353/mpq.2012.0025

Shi, Rushen. (2014). Functional morphemes and early language acquisition. *Child Development Perspectives*, *8*(1), 6–11. doi: 10.1111/cdep.12052

Shields, Margot & Tremblay, Mark S. (2010). Canadian childhood obesity estimates based on WHO, IOTF and CDC cut-points. *International Journal of Pediatric Obesity*, *5*(3), 265–273. doi: 10.3109/17477160903268282

Shonkoff, Jack P.; Siegel, Benjamin S.; Dobbins, Mary I.; Earls, Marian F.; Garner, Andrew S.; McGuinn, Laura, . . . Wood, David L. (2012). The lifelong effects of early childhood adversity and toxic stress. *Pediatrics*, *129*(1), e232–e246. doi: 10.1542/peds.2011-2663

Shutts, Kristin; Kinzler, Katherine D. & DeJesus, Jasmine M. (2013). Understanding infants' and children's social learning about foods: Previous research and new prospects. *Developmental Psychology*, *49*(3), 419–425. doi: 10.1037/a0027551

Siegal, Michael & Surian, Luca (Eds.). (2012). *Access to language and cognitive development*. New York, NY: Oxford University Press.

Siegler, Robert S. (2009). Improving the numerical understanding of children from low-income families. *Child Development Perspectives*, *3*(2), 118–124. doi: 10.1111/j.1750-8606.2009.00090.x

Siegler, Robert S. & Chen, Zhe. (2008). Differentiation and integration: Guiding principles for analyzing cognitive change. *Developmental Science*, *11*(4), 433–448. doi: 10.1111/j.1467-7687.2008.00689.x

Siegler, Robert S. & Mu, Yan. (2008). Chinese children excel on novel mathematics problems even before elementary school. *Psychological Science*, *19*(8), 759–763. doi: 10.1111/j.1467-9280.2008.02153.x

Silk, Timothy J. & Wood, Amanda G. (2011). Lessons about neurodevelopment from anatomical magnetic resonance imaging. *Journal of Developmental & Behavioral Pediatrics*, *32*(2), 158–168. doi: 10.1097/DBP.0b013e318206d58f

Silton, Nava R.; Flannelly, Laura T.; Flannelly, Kevin J. & Galek, Kathleen. (2011). Toward a theory of holistic needs and the brain. *Holistic Nursing Practice*, *25*(5), 258–265. doi: 10.1097/HNP.0b013e31822a0301

Silva, Katie G.; Correa-Chávez, Maricela & Rogoff, Barbara. (2010). Mexican-heritage children's attention and learning from interactions directed to others. *Child Development*, *81*(3), 898–912. doi: 10.1111/j.1467-8624.2010.01441.x

Simmons, Joseph P.; Nelson, Leif D. & Simonsohn, Uri. (2011). False-positive psychology: Undisclosed flexibility in data collection and analysis allows presenting anything as significant.

Psychological Science, 22(11), 1359–1366. doi: 10.1177/0956797611417632

Simpson, Jeffry A. & Kenrick, Douglas. (2013). *Evolutionary social psychology*. Hoboken, NJ: Taylor & Francis.

Simpson, Jeffry A. & Rholes, W. Steven (Eds.). (2015). *Attachment theory and research: New directions and emerging themes*. New York, NY: Guilford.

Singh, Amika; Uijtdewilligen, Léonie; Twisk, Jos W. R.; van Mechelen, Willem & Chinapaw, Mai J. M. (2012). Physical activity and performance at school: A systematic review of the literature including a methodological quality assessment. *Archives of Pediatrics & Adolescent Medicine, 166*(1), 49–55. doi: 10.1001/archpediatrics.2011.716

Singh, Leher. (2008). Influences of high and low variability on infant word recognition. *Cognition, 106*(2), 833–870. doi: 10.1016/j.cognition.2007.05.002

Sjöström, Lars; Peltonen, Markku; Jacobson, Peter; Ahlin, Sofie; Andersson-Assarsson, Johanna; Anveden, Åsa, . . . Carlsson, Lena M. S. (2014). Association of bariatric surgery with long-term remission of type 2 diabetes and with microvascular and macrovascular complications. *JAMA, 311*(22), 2297–2304. doi: 10.1001/jama.2014.5988

Skinner, B. F. (1953). *Science and human behavior*. New York, NY: Macmillan.

Skinner, B. F. (1957). *Verbal behavior*. New York, NY: Appleton-Century-Crofts.

Slack, Jonathan. (2012). *Stem cells: A very short introduction*. New York, NY: Oxford University Press.

Slater, Alan M. (2012). Imitation in infancy: Revisiting Meltzoff and Moore's (1977) study. In Alan M. Slater & Paul C. Quinn (Eds.), *Developmental psychology: Revisiting the classic studies*. Thousand Oaks, CA: Sage.

Slavich, George M. & Cole, Steven W. (2013). The emerging field of human social genomics. *Clinical Psychological Science, 1*(3), 331–348. doi: 10.1177/2167702613478594

Slining, Meghan; Adair, Linda S.; Goldman, Barbara D.; Borja, Judith B. & Bentley, Margaret. (2010). Infant overweight is associated with delayed motor development. *The Journal of Pediatrics, 157*(1), 20–25.e21. doi: 10.1016/j.jpeds.2009.12.054

Sloan, Mark. (2009). *Birth day: A pediatrician explores the science, the history, and the wonder of childbirth*. New York, NY: Ballantine Books.

Sloane, Stephanie; Baillargeon, Renée & Premack, David. (2012). Do infants have a sense of fairness? *Psychological Science, 23*(2), 196–204. doi: 10.1177/0956797611422072

Smetana, Judith G. (2013). Moral development: The Social Domain Theory view. In Philip D. Zelazo (Ed.), *The Oxford handbook of developmental psychology* (Vol. 1, pp. 832–866). New York, NY: Oxford University Press. doi: 10.1093/oxfordhb/9780199958450.013.0029

Smith, Michelle I.; Yatsunenko, Tanya; Manary, Mark J.; Trehan, Indi; Mkakosya, Rajhab; Cheng, Jiye, . . . Gordon, Jeffrey I. (2013). Gut microbiomes of Malawian twin pairs discordant for kwashiorkor. *Science, 339*(6119), 548–554. doi: 10.1126/science.1229000

Smith, Peter K. (2010). *Children and play: Understanding children's worlds*. Malden, MA: Wiley-Blackwell.

Smithells, R. W.; Sheppard, S.; Schorah, C. J.; Seller, M. J.; Nevin, N. C.; Harris, R., . . . Fielding, D. W. (2011). Apparent prevention of neural tube defects by periconceptional vitamin supplementation. *International Journal of Epidemiology, 40*(5), 1146–1154. doi: 10.1093/ije/dyr143

Snyder, Thomas D. & Dillow, Sally A. (2010). *Digest of education statistics, 2009*. Washington, DC: National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education.

Snyder, Thomas D. & Dillow, Sally A. (2013). *Digest of education statistics, 2012*. National Center for Education Statistics, Institute of Education Science, U.S. Department of Education.

Sobal, Jeffery & Hanson, Karla L. (2011). Marital status, marital history, body weight, and obesity. *Marriage & Family Review, 47*(7), 474–504. doi: 10.1080/01494929.2011.620934

Soderstrom, Melanie; Ko, Eon-Suk & Nevzorova, Uliana. (2011). It's a question? Infants attend differently to yes/no questions and declaratives. *Infant Behavior and Development, 34*(1), 107–110. doi: 10.1016/j.infbeh.2010.10.003

Soley, Gaye & Hannon, Erin E. (2010). Infants prefer the musical meter of their own culture: A cross-cultural comparison. *Developmental Psychology, 46*(1), 286–292. doi: 10.1037/a0017555

Solomon, Andrew. (2012). *Far from the tree: Parents, children and the search for identity*. New York, NY: Scribner.

Sophian, Catherine. (2013). Vicissitudes of children's mathematical knowledge: Implications of developmental research for early childhood mathematics education. *Early Education and Development, 24*(4), 436–442. doi: 10.1080/10409289.2013.773255

Soska, Kasey C.; Adolph, Karen E. & Johnson, Scott P. (2010). Systems in development: Motor skill acquisition facilitates three-dimensional object completion. *Developmental Psychology, 46*(1), 129–138. doi: 10.1037/a0014618

Sousa, David A. (2014). *How the brain learns to read* (2nd ed.). Thousand Oaks, CA: SAGE.

Sparks, Sarah D. (2012). Form + function = Finnish schools. *Education Week, 31*(36), 9.

Spelke, Elizabeth S. (1993). Object perception. In Alvin I. Goldman (Ed.), *Readings in philosophy and cognitive science* (pp. 447–460). Cambridge, MA: The MIT Press.

Spencer, John P.; Blumberg, Mark S.; McMurray, Bob; Robinson, Scott R.; Samuelson, Larissa K. & Tomblin, J. Bruce. (2009). Short arms and talking eggs: Why we should no longer abide the nativist–empiricist debate. *Child Development Perspectives, 3*(2), 79–87. doi: 10.1111/j.1750-8606.2009.00081.x

Sperry, Debbie M. & Widom, Cathy S. (2013). Child abuse and neglect, social support, and psychopathology in adulthood: A prospective investigation. *Child Abuse & Neglect, 37*(6), 415–425. doi: 10.1016/j.chiabu.2013.02.006

Sprietsma, Maresa. (2010). Effect of relative age in the first grade of primary school on long-term scholastic results: International comparative evidence using PISA 2003. *Education Economics, 18*(1), 1–32. doi: 10.1080/09645290802201961

Standing, E. M. (1998). *Maria Montessori: Her life and work*. New York, NY: Plume.

Stein, Arlene. (2006). *Shameless: Sexual dissidence in American culture*. New York, NY: New York University Press.

Stenseng, Frode; Belsky, Jay; Skalicka, Vera & Wichstrøm, Lars. (2014). Social exclusion predicts impaired self-regulation: A 2-year longitudinal panel study including the transition from preschool to school. *Journal of Personality*. doi: 10.1111/jopy.12096

Stephens, Nicole M.; Markus, Hazel Rose & Fryberg, Stephanie A. (2012). Social class disparities in health and education: Reducing inequality by applying a sociocultural self model of behavior. *Psychological Review, 119*(4), 723–744. doi: 10.1037/a0029028

Stern, Mark; Clonan, Sheila; Jaffee, Laura & Lee, Anna. (2014). The normative limits of choice: Charter schools, disability studies, and questions of inclusion. *Educational Policy*. doi: 10.1177/0895904813510779

Stern, Peter. (2013). Connection, connection, connection.... *Science, 342*(6158), 577. doi: 10.1126/science.342.6158.577

Sternberg, Robert J. (1985). *Beyond IQ: A triarchic theory of human intelligence*. New York, NY: Cambridge University Press.

Sternberg, Robert J. (2008). Schools should nurture wisdom. In Barbara Z. Presseisen (Ed.), *Teaching for intelligence* (2nd ed., pp. 61–88). Thousand Oaks, CA: Corwin Press.

Sternberg, Robert J. (2011). The theory of successful intelligence. In Robert J. Sternberg & Scott Barry Kaufman (Eds.), *The Cambridge handbook of intelligence* (pp. 504–526). New York, NY: Cambridge University Press.

Sternberg, Robert J. (2012). Why I became an administrator . . . and why you might become one too: Applying the science of psychology to the life of a university. *Observer, 25*(2), 21–22.

Sternberg, Robert J.; Jarvin, Linda & Grigorenko, Elena L. (2011). *Explorations in giftedness*. New York, NY: Cambridge University Press.

Stevens, Courtney & Bavelier, Daphne. (2012). The role of selective attention on academic foundations: A cognitive neuroscience perspective.

Developmental Cognitive Neuroscience, 2(Suppl. 1), S30–S48. doi: 10.1016/j.dcn.2011.11.001

Stevenson, Richard J.; Oaten, Megan J.; Case, Trevor I.; Repacholi, Betty M. & Wagland, Paul. (2010). Children's response to adult disgust elicitors: Development and acquisition. *Developmental Psychology*, *46*(1), 165–177. doi: 10.1037/a0016692

Stieb, David M.; Chen, Li; Eshoul, Maysoon & Judek, Stan. (2012). Ambient air pollution, birth weight and preterm birth: A systematic review and meta-analysis. *Environmental Research*, *117*, 100–111. doi: 10.1016/j.envres.2012.05.007

Stigler, James W. & Hiebert, James. (2009). *The teaching gap: Best ideas from the world's teachers for improving education in the classroom*. New York, NY: Free Press.

Stiles, Joan & Jernigan, Terry. (2010). The basics of brain development. *Neuropsychology Review*, *20*(4), 327–348. doi: 10.1007/s11065-010-9148-4

Stipek, Deborah. (2013). Mathematics in early childhood education. Revolution or evolution? *Early Education & Development*, *24*(4), 431–435. doi: 10.1080/10409289.2013.777285

Stolt, Suvi; Matomäki, Jaakko; Lind, Annika; Lapinleimu, Helena; Haataja, Leena & Lehtonen, Liisa. (2014). The prevalence and predictive value of weak language skills in children with very low birth weight – a longitudinal study. *Acta Paediatrica*, *103*(6), 651–658. doi: 10.1111/apa.12607

Stoneking, Mark & Delfin, Frederick. (2010). The human genetic history of East Asia: Weaving a complex tapestry. *Current Biology*, *20*(4), R188–R193. doi: 10.1016/j.cub.2009.11.052

Strait, Dana L.; Parbery-Clark, Alexandra; O'Connell, Samantha & Kraus, Nina. (2013). Biological impact of preschool music classes on processing speech in noise. *Developmental Cognitive Neuroscience*, *6*, 51–60. doi: 10.1016/j.dcn.2013.06.003

Straus, Murray A. & Paschall, Mallie J. (2009). Corporal punishment by mothers and development of children's cognitive ability: A longitudinal study of two nationally representative age cohorts. *Journal of Aggression, Maltreatment & Trauma*, *18*(5), 459–483. doi: 10.1080/10926770903035168

Stremmel, Andrew J. (2012). A situated framework: The Reggio experience. In Nancy File, et al. (Eds.), *Curriculum in early childhood education Re-examined, rediscovered, renewed* (pp. 133–145). New York, NY: Routledge.

Stroebe, Wolfgang; Postmes, Tom & Spears, Russell. (2012). Scientific misconduct and the myth of self-correction in science. *Perspectives on Psychological Science*, *7*(6), 670–688. doi: 10.1177/1745691612460687

Stubben, Jerry D. (2001). Working with and conducting research among American Indian families. *American Behavioral Scientist*, *44*(9), 1466–1481. doi: 10.1177/0002764201044009004

Stupica, Brandi; Sherman, Laura J. & Cassidy, Jude. (2011). Newborn irritability moderates the association between infant attachment security and toddler exploration and sociability. *Child Development*, *82*(5), 1381–1389. doi: 10.1111/j.1467-8624.2011.01618.x

Suchy, Frederick J.; Brannon, Patsy M.; Carpenter, Thomas O.; Fernandez, Jose R.; Gilsanz, Vicente; Gould, Jeffrey B., . . . Wolf, Marshall A. (2010). National Institutes of Health Consensus Development Conference: Lactose intolerance and health. *Annals of Internal Medicine*, *152*(12), 792–796. doi: 10.7326/0003-4819-152-12-201006150-00248

Sullivan, Shannon. (2014). *Good white people. The problem with middle-class white anti-racism*. Albany, NY: State University of New York Press.

Sun, Min & Rugolotto, Simone. (2004). Assisted infant toilet training in a Western family setting. *Journal of Developmental & Behavioral Pediatrics*, *25*(2), 99–101. doi: 10.1097/00004703-200404000-00004

Suomi, Steven J. (2002). Parents, peers, and the process of socialization in primates. In John G. Borkowski, et al. (Eds.), *Parenting and the child's world: Influences on academic, intellectual, and social-emotional development* (pp. 265–279). Mahwah, NJ: Erlbaum.

Surman, Craig B. H.; Hammerness, Paul G.; Pion, Katie & Faraone, Stephen V. (2013). Do stimulants improve functioning in adults with ADHD?: A review of the literature. *European Neuropsychopharmacology*, *23*(6), 528–533. doi: 10.1016/j.euroneuro.2012.02.010

Sutton-Smith, Brian. (2011). The antipathies of play. In Anthony D. Pellegrini (Ed.), *The Oxford handbook of the development of play* (pp. 110–115). New York, NY: Oxford University Press. doi: 10.1093/oxfordhb/9780195393002.013.0010

Swanson, H. Lee. (2013). Meta-analysis of research on children with learning disabilities. In H. Lee Swanson, et al. (Eds.), *Handbook of learning disabilities* (2nd ed., pp. 627–642). New York, NY: Guilford Press.

Tahmouresi, Niloufar; Bender, Caroline; Schmitz, Julian; Baleshzar, Alireza & Tuschen-Caffier, Brunna. (2014). Similarities and differences in emotion regulation and psychopathology in Iranian and German school-children: A cross-cultural study. *International Journal of Preventive Medicine*, *5*(1), 52–60.

Tajalli, Hassan & Garba, Houmma A. (2014). Discipline or prejudice? Overrepresentation of minority students in disciplinary alternative education programs. *The Urban Review*. doi: 10.1007/s11256-014-0274-9

Tamis-LeMonda, Catherine S.; Bornstein, Marc H. & Baumwell, Lisa. (2001). Maternal responsiveness and children's achievement of language milestones. *Child Development*, *72*(3), 748–767. doi: 10.1111/1467-8624.00313

Tamis-LeMonda, Catherine S.; Kuchirko, Yana & Song, Lulu. (2014). Why is infant language learning facilitated by parental responsiveness? *Current Directions in Psychological Science*, *23*(2), 121–126. doi: 10.1177/0963721414522813

Tamm, Leanne; Epstein, Jeffery N.; Denton, Carolyn A.; Vaughn, Aaron J.; Peugh, James & Willcutt, Erik G. (2014). Reaction time variability associated with reading skills in poor readers with ADHD. *Journal of the International Neuropsychological Society*, *20*(3), 292–301. doi: 10.1017/S1355617713001495

Tan, Patricia Z.; Armstrong, Laura M. & Cole, Pamela M. (2013). Relations between temperament and anger regulation over early childhood. *Social Development*, *22*(4), 755–772. doi: 10.1111/j.1467-9507.2012.00674.x

Tarullo, Amanda R.; Garvin, Melissa C. & Gunnar, Megan R. (2011). Atypical EEG power correlates with indiscriminately friendly behavior in internationally adopted children. *Developmental Psychology*, *47*(2), 417–431. doi: 10.1037/a0021363

Taveras, Elsie M.; Gillman, Matthew W.; Kleinman, Ken P.; Rich-Edwards, Janet W. & Rifas-Shiman, Sheryl L. (2013). Reducing racial/ethnic disparities in childhood obesity: The role of early life risk factors. *JAMA Pediatrics*, *167*(8), 731–738. doi: 10.1001/jamapediatrics.2013.85

Tay, Marc Tze-Hsin; Au Eong, Kah Guan; Ng, C. Y. & Lim, M. K. (1992). Myopia and educational attainment in 421,116 young Singaporean males. *Annals Academy of Medicine Singapore*, *21*(6), 785–791.

Taylor, Marjorie; Shawber, Alison B. & Mannering, Anne M. (2009). Children's imaginary companions: What is it like to have an invisible friend? In Keith D. Markman, et al. (Eds.), *Handbook of imagination and mental simulation* (pp. 211–224). New York, NY: Psychology Press.

Taylor, Rachael W.; Murdoch, Linda; Carter, Philippa; Gerrard, David F.; Williams, Sheila M. & Taylor, Barry J. (2009). Longitudinal study of physical activity and inactivity in preschoolers: The FLAME study. *Medicine & Science in Sports & Exercise*, *41*(1), 96–102. doi: 10.1249/MSS.0b013e3181849d81

Taylor, Zoe E.; Eisenberg, Nancy; Spinrad, Tracy L.; Eggum, Natalie D. & Sulik, Michael J. (2013). The relations of ego-resiliency and emotion socialization to the development of empathy and prosocial behavior across early childhood. *Emotion*, *13*(5), 822–831. doi: 10.1037/a0032894

Teiser, Johanna; Lamm, Bettina; Böning, Mirjam; Graf, Frauke; Gudi, Helene; Goertz, Claudia, . . . Keller, Heidi. (2014). Deferred imitation in 9-month-olds: How do model and task characteristics matter across cultures? *International Journal of Behavioral Development*, *38*(3), 247–254. doi: 10.1177/0165025413513706

Telzer, Eva H.; Flannery, Jessica; Shapiro, Mor; Humphreys, Kathryn L.; Goff, Bonnie; Gabard-Durman, Laurel, . . . Gee, Nim. (2013). Early experience shapes amygdala sensitivity to race: An international adoption design. *The Journal of Neuroscience*, *33*(33), 13484–13488. doi: 10.1523/JNEUROSCI.1272-13.2013

Teoh, Yee San & Lamb, Michael E. (2013). Interviewer demeanor in forensic interviews of

children. *Psychology, Crime & Law, 19*(2), 145–159. doi: 10.1080/1068316X.2011.614610

Terman, Lewis M. (1925). *Genetic studies of genius*. Stanford, CA: Stanford University Press.

Terry-McElrath, Yvonne M.; Turner, Lindsey; Sandoval, Anna; Johnston, Lloyd D. & Chaloupka, Frank J. (2014). Commercialism in US elementary and secondary school nutrition environments: Trends from 2007 to 2012. *JAMA Pediatrics, 168*(3), 234–242. doi: 10.1001/jamapediatrics.2013.4521

Tessier, Karen. (2010). Effectiveness of hands-on education for correct child restraint use by parents. *Accident Analysis & Prevention, 42*(4), 1041–1047. doi: 10.1016/j.aap.2009.12.011

Thelen, Esther & Corbetta, Daniela. (2002). Microdevelopment and dynamic systems: Applications to infant motor development. In Nira Granott & Jim Parziale (Eds.), *Microdevelopment: Transition processes in development and learning* (pp. 59–79). New York, NY: Cambridge University Press.

Thelen, Esther & Smith, Linda B. (2006). Dynamic systems theories. In Richard M. Lerner & William Damon (Eds.), *Handbook of child psychology* (6th ed., Vol. 1, pp. 258–312). Hoboken, NJ: Wiley.

Thomaes, Sander; Reijntjes, Albert; Orobio de Castro, Bram; Bushman, Brad J.; Poorthuis, Astrid & Telch, Michael J. (2010). I like me if you like me: On the interpersonal modulation and regulation of preadolescents' state self-esteem. *Child Development, 81*(3), 811–825. doi: 10.1111/j.1467-8624.2010.01435.x

Thomas, Alexander & Chess, Stella. (1977). *Temperament and development*. New York, NY: Brunner/Mazel.

Thomas, Michael S. C.; Van Duuren, Mike; Purser, Harry R. M.; Mareschal, Denis; Ansari, Daniel & Karmiloff-Smith, Annette. (2010). The development of metaphorical language comprehension in typical development and in Williams syndrome. *Journal of Experimental Child Psychology, 106*(2/3), 99–114. doi: 10.1016/j.jecp.2009.12.007

Thompson, Charis. (2014). Reproductions through technology. *Science, 344*(6182), 361–362. doi: 10.1126/science.1252641

Thompson, Clarissa A. & Siegler, Robert S. (2010). Linear numerical-magnitude representations aid children's memory for numbers. *Psychological Science, 21*(9), 1274–1281. doi: 10.1177/0956797610378309

Thompson, Ross A. (2006). The development of the person: Social understanding, relationships, conscience, self. In William Damon & Richard M. Lerner (Eds.), *Handbook of child psychology* (6th ed., Vol. 3, pp. 24–98). Hoboken, NJ: Wiley.

Thompson, Ross A. (2014). Conscience development in early childhood. In Melanie Killen & Judith G. Smetana (Eds.), *Handbook of moral development* (2nd ed., pp. 73–92). New York, NY: Psychology Press.

Thompson, Ross A. & Nelson, Charles A. (2001). Developmental science and the media. Early brain development. *American Psychologist, 56*(1), 5–15. doi: 10.1037//0003-066X.56.1.5

Thompson, Ross A. & Raikes, H. Abigail. (2003). Toward the next quarter-century: Conceptual and methodological challenges for attachment theory. *Development and Psychopathology, 15*(3), 691–718. doi: 10.1017/S0954579403000348

Thornberg, Robert & Jungert, Tomas. (2013). Bystander behavior in bullying situations: Basic moral sensitivity, moral disengagement and defender self-efficacy. *Journal of Adolescence, 36*(3), 475–483. doi: 10.1016/j.adolescence.2013.02.003

Thurber, James. (1999). The secret life of James Thurber. *The Thurber carnival* (pp. 35–41). New York, NY: Harper Perennial.

Tikotzky, Liat; Sharabany, Ruth; Hirsch, Idit & Sadeh, Avi. (2010). "Ghosts in the nursery:" Infant sleep and sleep-related cognitions of parents raised under communal sleeping arrangements. *Infant Mental Health Journal, 31*(3), 312–334. doi: 10.1002/imhj.20258

Tishkoff, Sarah A.; Reed, Floyd A.; Friedlaender, Françoise R.; Ehret, Christopher; Ranciaro, Alessia; Froment, Alain, . . . Williams, Scott M. (2009). The genetic structure and history of Africans and African Americans. *Science, 324*(5930), 1035–1044. doi: 10.1126/science.1172257

Titzmann, Peter F. & Silbereisen, Rainer K. (2009). Friendship homophily among ethnic German immigrants: A longitudinal comparison between recent and more experienced immigrant adolescents. *Journal of Family Psychology, 23*(3), 301–310. doi: 10.1037/a0015493

Tobey, Emily A.; Thal, Donna; Niparko, John K.; Eisenberg, Laurie S.; Quittner, Alexandra L. & Wang, Nae-Yuh. (2013). Influence of implantation age on school-age language performance in pediatric cochlear implant users. *International Journal of Audiology, 52*(4), 219–229. doi: 10.3109/14992027.2012.759666

Tomalski, Przemyslaw & Johnson, Mark H. (2010). The effects of early adversity on the adult and developing brain. *Current Opinion in Psychiatry, 23*(3), 233–238. doi: 10.1097/YCO.0b013e3283387a8c

Tomasello, Michael. (2006). Acquiring linguistic constructions. In William Damon & Richard M. Lerner (Eds.), *Handbook of child psychology* (6th ed., Vol. 2, pp. 255–298). Hoboken, NJ: Wiley.

Tomasello, Michael. (2009). Cultural transmission: A view from chimpanzees and human infants. In Ute Schönpflug (Ed.), *Cultural transmission: Psychological, developmental, social, and methodological aspects* (pp. 33–47). New York, NY: Cambridge University Press.

Tomasello, Michael & Herrmann, Esther. (2010). Ape and human cognition. *Current Directions in Psychological Science, 19*(1), 3–8. doi: 10.1177/0963721409359300

Tonyan, Holli A.; Mamikonian-Zarpas, Ani & Chien, Dorothy. (2013). Do they practice what they preach? An ecocultural, multidimensional, group-based examination of the relationship between beliefs and behaviours among child care providers. *Early Child Development and Care, 183*(12), 1853–1877. doi: 10.1080/03004430.2012.759949

Toporek, Bryan. (2012). Sports rules revised as research mounts on head injuries. *Education Week, 31*(22), 8.

Torbeyns, Joke; Schneider, Michael; Xin, Ziqiang & Siegler, Robert S. (2014). Bridging the gap: Fraction understanding is central to mathematics achievement in students from three different continents. *Learning and Instruction*, (In Press). doi: 10.1016/j.learninstruc.2014.03.002

Tough, Paul. (2012). *How children succeed: Grit, curiosity, and the hidden power of character*. Boston, MA: Houghton Mifflin Harcourt.

Trawick-Smith, Jeffrey. (2012). Teacher–child play interactions to achieve learning outcomes: Risks and opportunities. In Robert C. Pianta (Ed.), *Handbook of early childhood education* (pp. 259–277). New York, NY: Guilford Press.

Trommsdorff, Gisela & Cole, Pamela M. (2011). Emotion, self-regulation, and social behavior in cultural contexts. In Xinyin Chen & Kenneth H. Rubin (Eds.), *Sociocmotional development in cultural context* (pp. 131–163). New York, NY: Guilford Press.

Tronick, Edward. (1989). Emotions and emotional communication in infants. *American Psychologist, 44*(2), 112–119. doi: 10.1037//0003-066X.44.2.112

Tronick, Edward & Beeghly, Marjorie. (2011). Infants' meaning-making and the development of mental health problems. *American Psychologist, 66*(2), 107–119. doi: 10.1037/a0021631

Tronick, Edward & Weinberg, M. Katherine. (1997). Depressed mothers and infants: Failure to form dyadic states of consciousness. In Lynne Murray & Peter J. Cooper (Eds.), *Postpartum depression and child development* (pp. 54–81). New York, NY: Guilford Press.

Tsao, Feng-Ming; Liu, Huei-Mei & Kuhl, Patricia K. (2004). Speech perception in infancy predicts language development in the second year of life: A longitudinal study. *Child Development, 75*(4), 1067–1084. doi: 10.1111/j.1467-8624.2004.00726.x

Tsethlikai, Monica & Rogoff, Barbara. (2013). Involvement in traditional cultural practices and American Indian children's incidental recall of a folktale. *Developmental Psychology, 49*(3), 568–578. doi: 10.1037/a0031308

Ttofi, Maria M.; Bowes, Lucy; Farrington, David P. & Lösel, Friedrich. (2014). Protective factors interrupting the continuity from school bullying to later internalizing and externalizing problems: A systematic review of prospective longitudinal studies. *Journal of School Violence, 13*(1), 5–38. doi: 10.1080/15388220.2013.857345

Tucker-Drob, Elliot M.; Rhemtulla, Mijke; Harden, K. Paige; Turkheimer, Eric & Fask, David. (2011). Emergence of a gene × socioeconomic status interaction on infant mental ability between 10 months and 2 years.

Psychological Science, 22(1), 125–133. doi: 10.1177/0956797610392926

Tudge, Jonathan. (2008). *The everyday lives of young children: Culture, class, and child rearing in diverse societies*. New York, NY: Cambridge University Press.

Tudge, Jonathan R. H.; Doucet, Fabienne; Odero, Dolphine; Sperb, Tania M.; Piccinini, Cesar A. & Lopes, Rita S. (2006). A window into different cultural worlds: Young children's everyday activities in the United States, Brazil, and Kenya. *Child Development*, 77(5), 1446–1469. doi: 10.1111/j.1467-8624.2006.00947.x

Tummeltshammer, Kristen S.; Wu, Rachel; Sobel, David M. & Kirkham, Natasha Z. (2014). Infants track the reliability of potential informants. *Psychological Science*, 25(9), 1730–1738. doi: 10.1177/0956797614540178

Turiel, Elliot. (2002). *The culture of morality. Social development, context, and conflict*. New York, NY: Cambridge University Press.

Turiel, Elliot. (2006). The development of morality. In William Damon & Richard M. Lerner (Eds.), *Handbook of child psychology* (6th ed., Vol. 3, pp. 789–857). Hoboken, NJ: Wiley.

Turiel, Elliot. (2008). Thought about actions in social domains: Morality, social conventions, and social interactions. *Cognitive Development*, 23(1), 136–154. doi: 10.1016/j.cogdev.2007.04.001

Turley, Ruth N. López & Desmond, Matthew. (2011). Contributions to college costs by married, divorced, and remarried parents. *Journal of Family Issues*, 32(6), 767–790. doi: 10.1177/0192513x10388013

Turner, Heather A.; Finkelhor, David; Ormrod, Richard; Hamby, Sherry; Leeb, Rebecca T.; Mercy, James A. & Holt, Melissa. (2012). Family context, victimization, and child trauma symptoms: Variations in safe, stable, and nurturing relationships during early and middle childhood. *American Journal of Orthopsychiatry*, 82(2), 209–219. doi: 10.1111/j.1939-0025.2012.01147.x

U.S. Bureau of Labor Statistics. (2011). *The employment situation—November 2011*. Washington, DC: U.S. Department of Labor.

U.S. Bureau of Labor Statistics. (2013, April 30). *Employment characteristics of families, 2012*. Washington, DC: U.S. Department of Labor.

U.S. Census Bureau. (1981). *Current population survey: November, 1979*. Ann Arbor, MI: U.S. Department of Commerce, Bureau of the Census.

U.S. Census Bureau. (1989). *Current population survey: November, 1989*. Ann Arbor, MI: U.S. Department of Commerce, Bureau of the Census.

U.S. Census Bureau. (1992). *Current population survey: October, 1992*. Washington, DC: U.S. Department of Commerce, Economic and Statistics Administration, U.S. Census Bureau.

U.S. Census Bureau. (1995). *Current population survey: October, 1995*. Washington, DC: U.S. Department of Commerce, Economic and Statistics Administration, U.S. Census Bureau.

U.S. Census Bureau. (1999). *Current population survey: October, 1999*. Washington, DC: U.S. Department of Commerce, Economic and Statistics Administration, U.S. Census Bureau.

U.S. Census Bureau. (2010). *Annual estimates of the resident population by sex, race, and Hispanic origin for the United States: April 1, 2000 to July 1, 2009*. Washington, DC: U.S. Census Bureau.

U.S. Census Bureau. (2011). *America's families and living arrangements: 2011*. U.S. Department of Commerce, Economics and Statistics Administration, U.S. Census Bureau.

U.S. Census Bureau. (2013a). *America's families and living arrangements: 2012*. Washington, DC: U.S. Department of Commerce, Economics and Statistics Administration, U.S. Census Bureau.

U.S. Census Bureau. (2013b). *2009–2013 American Community Survey 5-year estimates: Poverty*. Washington, DC: U.S. Department of Commerce, United States Census Bureau.

U.S. Department of Health and Human Services. (2003). *Child maltreatment 2001*. Washington, DC: Administration for Children and Families, Administration on Children Youth and Families, Children's Bureau.

U.S. Department of Health and Human Services. (2008). *Child maltreatment 2006*. Washington, DC: Administration for Children and Families, Administration on Children Youth and Families, Children's Bureau.

U.S. Department of Health and Human Services. (2010). *Head Start impact study: Final report*. Washington, DC: Administration for Children and Families.

U.S. Department of Health and Human Services. (2011). *The Surgeon General's call to action to support breastfeeding*. Washington, DC: U.S. Department of Health and Human Services, Office of the Surgeon General.

U.S. Department of Health and Human Services. (2011). *Child maltreatment 2010*. Washington, DC: Administration for Children and Families, Administration on Children Youth and Families, Children's Bureau.

U.S. Department of Health and Human Services. (2012). *Child maltreatment 2011*. Washington, DC: Administration for Children and Families, Administration on Children Youth and Families, Children's Bureau.

U.S. Department of Health and Human Services. (2012, November). *National surveillance of asthma. United States, 2001–2010*. Hyattsville, MD: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics, 3(35), 31, Table 32.

U.S. Department of Health and Human Services. (2013, December). *Child maltreatment 2012*. Washington, DC: Administration for Children and Families, Administration on Children Youth and Families, Children's Bureau.

U.S. Department of Transportation. (2013a). *Traffic safety facts, pedestrians: 2011 data*. Washington, DC: National Center for Statistics and Analysis.

U.S. Department of Transportation. (2013b). *Traffic safety facts, children: 2011 data*. Washington, DC: National Center for Statistics and Analysis.

Uekermann, J.; Kraemer, M.; Abdel-Hamid, M.; Schimmelmann, B. G.; Hebebrand, J.; Daum, I., . . . Kis, B. (2010). Social cognition in Attention-deficit hyperactivity disorder (ADHD). *Neuroscience & Biobehavioral Reviews*, 34(5), 734–743. doi: 10.1016/j.neubiorev.2009.10.009

UNESCO. (2012). *Global education digest, 2012: Opportunities lost: The impact of grade repetition and early school leaving*. Montreal, Canada: United Nations Educational, Scientific and Cultural Organization Institute for Statistics.

UNICEF. (2012). *The state of the world's children 2012: Children in an urban world*. New York, NY: United Nations.

UNICEF. (2014a, October). Low birthweight: Percentage of infants weighing less than 2,500 grams at birth. UNICEF global databases, based on DHS, MICS, other national household surveys, data from routine reporting systems, UNICEF and WHO. Retrieved from: http://data.unicef.org/nutrition/low-birthweight

UNICEF. (2014b, October). Infant and young child feeding. UNICEF Global Databases. Retrieved from: http://www.unicef.org/nutrition/index_breastfeeding.html

United Nations. (2011). *The millennium development goals report 2011*. New York, NY: United Nations.

United Nations. (2013). *World population prospects: The 2012 revision, Volume 1: Comprehensive tables*. New York, NY: Population Division of the United Nations Department of Economic and Social Affairs of the United Nations Secretariat, Department of Economic and Social Affairs.

United Nations Children's Fund; World Health Organization & The World Bank. (2012). *Levels and trends in child malnutrition: UNICEF–WHO–World Bank joint child malnutrition estimates*. UNICEF, New York; WHO, Geneva; The World Bank, Washington, DC.

Ursache, Alexandra; Blair, Clancy; Stifter, Cynthia & Voegtline, Kristin. (2013). Emotional reactivity and regulation in infancy interact to predict executive functioning in early childhood. *Developmental Psychology*, 49(1), 127–137. doi: 10.1037/a0027728

Utendale, William T. & Hastings, Paul D. (2011). Developmental changes in the relations between inhibitory control and externalizing problems during early childhood. *Infant and Child Development*, 20(2), 181–193. doi: 10.1002/icd.691

Vaala, Sarah E.; Linebarger, Deborah L.; Fenstermacher, Susan K.; Tedone, Ashley; Brey, Elizabeth; Barr, Rachel, . . . Calvert, Sandra L. (2010). Content analysis of language-promoting teaching strategies used in infant-directed media. *Infant and Child Development*, 19(6), 628–648. doi: 10.1002/icd.715

Valdez, Carmen R.; Chavez, Tom & Woulfe, Julie. (2013). Emerging adults' lived experience of formative family stress: The family's lasting

influence. *Qualitative Health Research*, *23*(8), 1089–1102. doi: 10.1177/1049732313494271

Valsiner, Jaan. (2006). Developmental epistemology and implications for methodology. In Richard M. Lerner & William Damon (Eds.), *Handbook of child psychology* (6th ed., Vol. 1, pp. 166–209). Hoboken, NJ: Wiley.

van den Akker, Alithe; Deković, Maja; Prinzie, Peter & Asscher, Jessica. (2010). Toddlers' temperament profiles. Stability and relations to negative and positive parenting. *Journal of Abnormal Child Psychology*, *38*(4), 485–495. doi: 10.1007/s10802-009-9379-0

van den Ban, Els; Souverein, Patrick; Swaab, Hanna; van Engeland, Herman; Heerdink, Rob & Egberts, Toine. (2010). Trends in incidence and characteristics of children, adolescents, and adults initiating immediate- or extended-release methylphenidate or atomoxetine in the Netherlands during 2001–2006. *Journal of Child and Adolescent Psychopharmacology*, *20*(1), 55–61. doi: 10.1089/cap.2008.0153

van Eeden-Moorefield, Brad & Pasley, Kay. (2013). Remarriage and stepfamily life. In Gary W. Peterson & Kevin R. Bush (Eds.), *Handbook of marriage and the family* (pp. 517–546). New York, NY: Springer. doi: 10.1007/978-1-4614-3987-5_22

van Hof, Paulion; van der Kamp, John & Savelsbergh, Geert J. P. (2008). The relation between infants' perception of catchableness and the control of catching. *Developmental Psychology*, *44*(1), 182–194. doi: 10.1037/0012-1649.44.1.182

van IJzendoorn, Marinus H.; Bakermans-Kranenburg, Marian J.; Pannebakker, Fieke & Out, Dorothée. (2010). In defence of situational morality: Genetic, dispositional and situational determinants of children's donating to charity. *Journal of Moral Education*, *39*(1), 1–20. doi: 10.1080/03057240903528535

Van Puyvelde, Martine; Vanfleteren, Pol; Loots, Gerrit; Deschuyffeleer, Sara; Vinck, Bart; Jacquet, Wolfgang & Verhelst, Werner. (2010). Tonal synchrony in mother-infant interaction based on harmonic and pentatonic series. *Infant Behavior and Development*, *33*(4), 387–400. doi: 10.1016/j.infbeh.2010.04.003

van Soelen, Inge L. C.; Brouwer, Rachel M.; Peper, Jiska S.; van Beijsterveldt, Toos C. E. M.; van Leeuwen, Marieke; de Vries, Linda S., . . . Boomsma, Dorret I. (2010). Effects of gestational age and birth weight on brain volumes in healthy 9 year-old children. *The Journal of Pediatrics*, *156*(6), 896–901. doi: 10.1016/j.jpeds.2009.12.052

Vandermassen, Griet. (2005). *Who's afraid of Charles Darwin? Debating feminism and evolutionary theory*. Lanham, MD: Rowman & Littlefield.

Varga, Colleen M.; Gee, Christina B. & Munro, Geoffrey. (2011). The effects of sample characteristics and experience with infidelity on romantic jealousy. *Sex Roles*, *65*(11/12), 854–866. doi: 10.1007/s11199-011-0048-8

Varga, M. E.; Pavlova, O. G. & Nosova, S. V. (2010). The counting function and its representation in the parietal cortex in humans and animals. *Neuroscience and Behavioral Physiology*, *40*(2), 185–196. doi: 10.1007/s11055-009-9238-z

Veenstra, René; Lindenberg, Siegwart; Munniksma, Anke & Dijkstra, Jan Kornelis. (2010). The complex relation between bullying, victimization, acceptance, and rejection: Giving special attention to status, affection, and sex differences. *Child Development*, *81*(2), 480–486. doi: 10.1111/j.1467-8624.2009.01411.x

Vennemann, Mechtild M.; Hense, Hans-Werner; Bajanowski, Thomas; Blair, Peter S.; Complojer, Christina; Moon, Rachel Y. & Kiechl-Kohlendorfer, Ursula. (2012). Bed sharing and the risk of sudden infant death syndrome: Can we resolve the debate? *The Journal of Pediatrics*, *160*(1), 44–48. doi: 10.1016/j.jpeds.2011.06.052

Vered, Karen O. (2008). *Children and media outside the home: Playing and learning in after-school care*. New York, NY: Palgrave Macmillan.

Verona, Sergiu. (2003). Romanian policy regarding adoptions. In Victor Littel (Ed.), *Adoption update* (pp. 5–10). New York, NY: Nova Science.

Vitale, Susan; Sperduto, Robert D. & Ferris, Frederick L. (2009). Increased prevalence of myopia in the United States between 1971–1972 and 1999–2004. *Archives of Ophthalmology*, *127*(12), 1632–1639. doi: 10.1001/archophthalmol.2009.303

Vogel, Gretchen. (2010). Diseases in a dish take off. *Science*, *330*(6008), 1172–1173. doi: 10.1126/science.330.6008.1172

von Mutius, Erika & Vercelli, Donata. (2010). Farm living: Effects on childhood asthma and allergy. *Nature Reviews Immunology*, *10*(12), 861–868. doi: 10.1038/nri2871

Vonderheid, Susan C.; Kishi, Rieko; Norr, Kathleen F. & Klima, Carrie. (2011). Group prenatal care and doula care for pregnant women. In Arden Handler, et al. (Eds.), *Reducing racial/ethnic disparities in reproductive and perinatal outcomes: The evidence from population-based interventions* (pp. 369–400). New York, NY: Springer. doi: 10.1007/978-1-4419-1499-6_15

Vong, Keang-Ieng. (2013). China: Pedagogy today and the move towards creativity. In Jan Georgeson & Jane Payler (Eds.), *International perspectives on early childhood education and care*. New York, NY: Open University Press.

Vouloumanos, Athena & Werker, Janet F. (2007). Listening to language at birth: Evidence for a bias for speech in neonates. *Developmental Science*, *10*(2), 159–164. doi: 10.1111/j.1467-7687.2007.00549.x

Vygotsky, Lev S. (1980). *Mind in society: The development of higher psychological processes*. Cambridge, MA: Harvard University Press.

Vygotsky, Lev S. (1987). Thinking and speech. In Robert W. Rieber & Aaron S. Carton (Eds.), *The collected works of L. S. Vygotsky* (Vol. 1, pp. 39–285). New York, NY: Springer.

Vygotsky, Lev S. (1994a). The development of academic concepts in school aged children. In René van der Veer & Jaan Valsiner (Eds.), *The Vygotsky reader* (pp. 355–370). Cambridge, MA: Blackwell.

Vygotsky, Lev S. (1994b). Principles of social education for deaf and dumb children in Russia. In Rene van der Veer & Jaan Valsiner (Eds.), *The Vygotsky reader* (pp. 19–26). Cambridge, MA: Blackwell.

Vygotsky, Lev S. (2012). *Thought and language*. Cambridge, MA: The MIT Press.

Wagner, Katie; Dobkins, Karen & Barner, David. (2013). Slow mapping: Color word learning as a gradual inductive process. *Cognition*, *127*(3), 307–317. doi: 10.1016/j.cognition.2013.01.010

Wagner, Laura & Lakusta, Laura. (2009). Using language to navigate the infant mind. *Perspectives on Psychological Science*, *4*(2), 177–184. doi: 10.1111/j.1745-6924.2009.01117.x

Wahlstrom, Dustin; Collins, Paul; White, Tonya & Luciana, Monica. (2010). Developmental changes in dopamine neurotransmission in adolescence: Behavioral implications and issues in assessment. *Brain and Cognition*, *72*(1), 146–159. doi: 10.1016/j.bandc.2009.10.013

Wakefield, A. J.; Murch, S. H.; Anthony, A.; Linnell, J.; Casson, D. M.; Malik, M., . . . Walker-Smith, J. A. (1998). Ileal-lymphoid-nodular hyperplasia, non-specific colitis, and pervasive developmental disorder in children. *The Lancet*, *351*(9103), 637–641.

Walker, Peter; Bremner, J. Gavin; Mason, Uschi; Spring, Jo; Mattock, Karen; Slater, Alan & Johnson, Scott P. (2010). Preverbal infants' sensitivity to synaesthetic cross-modality correspondences. *Psychological Science*, *21*(1), 21–25. doi: 10.1177/0956797609354734

Walle, Eric A. & Campos, Joseph J. (2014). Infant language development is related to the acquisition of walking. *Developmental Psychology*, *50*(2), 336–348. doi: 10.1037/a0033238

Wallis, Claudia. (2014). Gut reactions: Intestinal bacteria may help determine whether we are lean or obese. *Scientific American*, *310*(6), 30–33. doi: 10.1038/scientificamerican0614-30

Wambach, Karen & Riordan, Jan. (2014). *Breastfeeding and human lactation* (5th ed.). Burlington, MA: Jones & Bartlett Publishers.

Wang, Chao; Xue, Haifeng; Wang, Qianqian; Hao, Yongchen; Li, Dianjiang; Gu, Dongfeng & Huang, Jianfeng. (2014). Effect of drinking on all-cause mortality in women compared with men: A meta-analysis. *Journal of Women's Health*, *23*(5). doi: 10.1089/jwh.2013.4414

Wang, Jingyun & Candy, T. Rowan. (2010). The sensitivity of the 2- to 4-month-old human infant accommodation system. *Investigative Ophthalmology and Visual Science*, *51*(6), 3309–3317. doi: 10.1167/iovs.09-4667

Wang, Xueli. (2013). Modeling entrance into STEM fields of study among students beginning at community colleges and four-year institutions. *Research in Higher Education*, *54*(6), 664–692. doi: 10.1007/s11162-013-9291-x

Washington, Harriet A. (2006). *Medical apartheid: The dark history of medical experimentation on*

Black Americans from colonial times to the present. New York, NY: Doubleday.

Watkins-Lewis, Karen M. & Hamre, Bridget K. (2012). African-American parenting characteristics and their association with children's cognitive and academic school readiness. *Journal of African American Studies, 16*(3), 390–405. doi: 10.1007/s12111-011-9195-9

Watrin, João P. & Darwich, Rosângela. (2012). On behaviorism in the cognitive revolution: Myth and reactions. *Review of General Psychology, 16*(3), 269–282. doi: 10.1037/a0026766

Watson, John B. (1928). *Psychological care of infant and child*. New York, NY: Norton.

Watson, John B. (1998). *Behaviorism*. New Brunswick, NJ: Transaction.

Waxman, Sandra; Fu, Xiaolan; Arunachalam, Sudha; Leddon, Erin; Geraghty, Kathleen & Song, Hyun-joo. (2013). Are nouns learned before verbs? Infants provide insight into a long-standing debate. *Child Development Perspectives*, 7(3), 155–159. doi: 10.1111/cdep.12032

Waxman, Sandra R. & Lidz, Jeffrey L. (2006). Early word learning. In William Damon & Richard M. Lerner (Eds.), *Handbook of child psychology* (6th ed., Vol. 2, pp. 299–335). Hoboken, NJ: Wiley.

Weikum, Whitney M.; Vouloumanos, Athena; Navarra, Jordi; Soto-Faraco, Salvador; Sebastian-Galles, Nuria & Werker, Janet F. (2007). Visual language discrimination in infancy. *Science, 316*(5828), 1159. doi: 10.1126/science.1137686

Weinstein, Netta & DeHaan, Cody. (2014). On the mutuality of human motivation and relationships. In Netta Weinstein (Ed.), *Human motivation and interpersonal relationships: Theory, research, and applications* (pp. 3–25). New York, NY: Springer. doi: 10.1007/978-94-017-8542-6_1

Weisman, Omri; Zagoory-Sharon, Orna & Feldman, Ruth. (2014). Oxytocin administration, salivary testosterone, and father–infant social behavior. *Progress in Neuro-Psychopharmacology and Biological Psychiatry, 49*(3), 47–52. doi: 10.1016/j.pnpbp.2013.11.006

Weismer, Susan E.; Venker, Courtney E.; Evans, Julia L. & Moyle, Maura J. (2013). Fast mapping in late-talking toddlers. *Applied Psycholinguistics, 34*(1), 69–89. doi: 10.1017/S0142716411000610

Weiss, Nicole H.; Tull, Matthew T.; Lavender, Jason & Gratz, Kim L. (2013). Role of emotion dysregulation in the relationship between childhood abuse and probable PTSD in a sample of substance abusers. *Child Abuse & Neglect*, 37(11), 944–954. doi: 10.1016/j.chiabu.2013.03.014

Weiss, Noel S. & Koepsell, Thomas D. (2014). *Epidemiologic methods: Studying the occurrence of illness* (2nd ed.). New York, NY: Oxford University Press.

Wellman, Henry M.; Fang, Fuxi & Peterson, Candida C. (2011). Sequential progressions in a theory-of-mind scale: Longitudinal perspectives. *Child Development*, 82(3), 780–792. doi: 10.1111/j.1467-8624.2011.01583.x

Wen, Xiaoli; Elicker, James G. & McMullen, Mary B. (2011). Early childhood teachers' curriculum beliefs: Are they consistent with observed classroom practices? *Early Education & Development*, 22(6), 945–969. doi: 10.1080/10409289.2010.507495

Wendelken, Carter; Baym, Carol L.; Gazzaley, Adam & Bunge, Silvia A. (2011). Neural indices of improved attentional modulation over middle childhood. *Developmental Cognitive Neuroscience, 1*(2), 175–186. doi: 10.1016/j.dcn.2010.11.001

Wenner, Melinda. (2009). The serious need for play. *Scientific American Mind, 20*(1), 22–29. doi: 10.1038/scientificamericanmind0209-22

Werner, Nicole E. & Hill, Laura G. (2010). Individual and peer group normative beliefs about relational aggression. *Child Development, 81*(3), 826–836. doi: 10.1111/j.1467-8624.2010.01436.x

Whiteside-Mansell, Leanne; Bradley, Robert H.; Casey, Patrick H.; Fussell, Jill J. & Conners-Burrow, Nicola A. (2009). Triple risk: Do difficult temperament and family conflict increase the likelihood of behavioral maladjustment in children born low birth weight and preterm? *Journal of Pediatric Psychology*, 34(4), 396–405. doi: 10.1093/jpepsy/jsn089

Whitfield, Keith E. & McClearn, Gerald. (2005). Genes, environment, and race: Quantitative genetic approaches. *American Psychologist, 60*(1), 104–114. doi: 10.1037/0003-066X.60.1.104

Wicherts, Jelte M.; Dolan, Conor V. & van der Maas, Han L. J. (2010). The dangers of unsystematic selection methods and the representativeness of 46 samples of African test-takers. *Intelligence*, 38(1), 30–37. doi: 10.1016/j.intell.2009.11.003

Wilhelm, Miriam; Dahl, Edgar; Alexander, Henry; Brähler, Elmar & Stöbel-Richter, Yve. (2013). Ethical attitudes of German specialists in reproductive medicine and legal regulation of preimplantation sex selection in Germany. *PloS, 8*(2), e56390. doi: 10.1371/journal.pone.0056390

Williams, Lela Rankin; Fox, Nathan A.; Lejuez, C. W.; Reynolds, Elizabeth K.; Henderson, Heather A.; Perez-Edgar, Koraly E., . . . Pine, Daniel S. (2010). Early temperament, propensity for risk-taking and adolescent substance-related problems: A prospective multimethod investigation. *Addictive Behaviors*, 35(2), 1148–1151. doi: 10.1016/j.addbeh.2010.07.005

Willoughby, Michael T.; Mills-Koonce, W. Roger; Gottfredson, Nisha C. & Wagner, Nicholas J. (2014). Measuring callous unemotional behaviors in early childhood: Factor structure and the prediction of stable aggression in middle childhood. *Journal of Psychopathology and Behavioral Assessment*, 36(1), 30–42. doi: 10.1007/s10862-013-9379-9

Wilmshurst, Linda. (2011). *Child and adolescent psychopathology: A casebook* (2nd ed.). Thousand Oaks, CA: Sage.

Wilson, Kathryn R.; Hansen, David J. & Li, Ming. (2011). The traumatic stress response in child maltreatment and resultant neuropsychological effects. *Aggression and Violent Behavior, 16*(2), 87–97. doi: 10.1016/j.avb.2010.12.007

Winsler, Adam; Fernyhough, Charles & Montero, Ignacio (Eds.). (2009). *Private speech, executive functioning, and the development of verbal self-regulation*. New York, NY: Cambridge University Press.

Winter, Suzanne M. (2011). Culture, health, and school readiness. In DeAnna M. Laverick & Mary Renck Jalongo (Eds.), *Transitions to early care and education* (Vol. 4, pp. 117–133). New York, NY: Springer. doi: 10.1007/978-94-007-0573-9_11

Wittassek, Matthias; Koch, Holger Martin; Angerer, Jürgen & Brüning, Thomas. (2011). Assessing exposure to phthalates – The human biomonitoring approach. *Molecular Nutrition & Food Research*, 55(1), 7–31. doi: 10.1002/mnfr.201000121

Wolfe, Christy D.; Zhang, Jing; Kim-Spoon, Jungmeen & Bell, Martha Ann. (2014). A longitudinal perspective on the association between cognition and temperamental shyness. *International Journal of Behavioral Development*, 38(3), 266–276. doi: 10.1177/0165025413516257

Woodrow, Christine. (2014). Refocusing our attention to children's learning and the complex interplay of context and culture. *International Journal of Early Years Education*, 22(1), 1–3. doi: 10.1080/09669760.2014.902639

Woodward, Amanda L. & Markman, Ellen M. (1998). Early word learning. In Deanna Kuhn & Robert S. Siegler (Eds.), *Handbook of child psychology* (5th ed., Vol. 2, pp. 371–420). Hoboken, NJ: Wiley.

Woodward, B. J.; Papile, L.-A.; Lowe, J. R.; Laadt, V. L.; Shaffer, M. L.; Montman, R. & Watterberg, K. L. (2011). Use of the Ages and Stages Questionnaire and Bayley Scales of Infant Development-II in neurodevelopmental follow-up of extremely low birth weight infants. *Journal of Perinatology*, 31(10), 641–646. doi: 10.1038/jp.2011.1

Woolley, Jacqueline D. & Ghossainy, Maliki E. (2013). Revisiting the fantasy-reality distinction: Children as naïve skeptics. *Child Development*, 84(5), 1496–1510. doi: 10.1111/cdev.12081

World Bank. (1994). *World development report 1994: Infrastructure for development*. New York, NY: Oxford University Press.

World Bank. (2014). *Table 2.11: World Development indicators, participation in education*. Washington, DC: World Bank.

World Health Organization. (2006). WHO Motor Development Study: Windows of achievement for six gross motor development milestones. *Acta Paediatrica*, 95(Suppl. 450), 86–95. doi: 10.1111/j.1651-2227.2006.tb02379.x

World Health Organization. (2010). WHO global infobase: NCD indicators. https://apps.who.int/infobase/Indicators.aspx

World Health Organization. 2011. WHO global infobase. NCDindicators. https://apps.who.int/infobase/Indicators.aspx

World Health Organization. 2012, May 18. Progress toward interruption of wild poliovirus transmission—Worldwide, January 2011–March 2012. weekly. *Morbidity and Mortality Weekly Report*, *61*(19), 353–357.

World Health Organization. 2014. Infant and young child feeding data by country. Retrieved from http://www.who.int/nutrition/databases/infantfeeding/countries/en

World Health Organization. 2014. Malnutrition prevalence, height for age (% of children under 5). from The World Bank.

Wosje, Karen S.; Khoury, Philip R.; Claytor, Randal P.; Copeland, Kristen A.; Hornung, Richard W.; Daniels, Stephen R. & Kalkwarf, Heidi J. 2010. Dietary patterns associated with fat and bone mass in young children. *American Journal of Clinical Nutrition*, *91*(2), 294–303. doi: 10.3945/ajcn.2009.28259.

Xu, Fei. 2013. The object concept in human infants: Commentary on fields. *Human Development*, *56*(3), 167–170. doi: 10.1159/000351279.

Xu, Fei & Kushnir, Tamar. 2013. Infants are rational constructivist learners. *Current Directions in Psychological Science*, *22*(1), 28–32. doi: 10.1177/0963721412469396.

Xu, Yaoying. 2010. Children's social play sequence: Parten's classic theory revisited. *Early Child Development and Care*, *180*(4), 489–498. doi: 10.1080/03004430802090430.

Yamaguchi, Susumu; Greenwald, Anthony G.; Banaji, Mahzarin R.; Murakami, Fumio; Chen, Daniel; Shiomura, Kimihiro, . . . Krendl, Anne. 2007. Apparent universality of positive implicit self-esteem. *Psychological Science*, *18*(6), 498–500. doi: 10.1111/j.14o7-9280.2007.01928.x

Yang, Rongwang; Zhang, Suhan; Li, Rong & Zhao, Zhengyan. 2013. Parents' attitudes toward stimulants use in China. *Journal of Developmental & Behavioral Pediatrics*, *34*(4), 225. doi: 10.1097/DBP.0b013e318287ee27

Yurovsky, Daniel; Fricker, Damian C.; Yu, Chen & Smith, Linda B. 2014. The role of partial knowledge in statistical word learning. *Psychonomic Bulletin & Review*, *21*(1), 1–22. doi: 10.3758/s13423-013-0443-x

Zachry, Anne H. & Kitzmann, Katherine M. 2011. Caregiver awareness of prone play recommendations. *American Journal of Occupational Therapy*, *65*(1), 101–105. doi: 10.5014/ajot.2011.000463.

Zahn-Waxler, Carolyn; Park, Jong-Hyo; Usher, Barbara; Belouad, Francesca; Cole, Pamela & Gruber, Reut. 2008. Young children's representations of conflict and distress: A longitudinal study of boys and girls with disruptive behavior problems. *Development and Psychopathology*, *20*(1), 99–119. doi: 10.1017/S0954579408000059.

Zak, Paul J. 2012. *The moral molecule: The source of love and prosperity*. New York, NY: Dutton.

Zalenski, Robert J. & Raspa, Richard. 2006. Maslow's hierarchy of needs: A framework for achieving human potential in hospice. *Journal of Palliative Medicine*, *9*(5), 1120–1127. doi: 10.1089/jpm.2006.9.1120.

Zapf, Jennifer A. & Smith, Linda B. 2007. When do children generalize the plural to novel nouns? *First Language*, *27*(1), 53–78. doi: 10.1177/0142723707070286.

Zatorre, Robert J. 2013. Predispositions and plasticity in music and speech learning: Neural correlates and implications. *Science*, *342*(6158), 585–589. doi: 10.1126/science.1238414.

Zavos, Helena M. S.; Gregory, Alice M. & Eley, Thalia C. 2012. Longitudinal genetic analysis of anxiety sensitivity. *Developmental Psychology*, *48*(1), 204–212. doi: 10.1037/a0024956.

Zeanah, Charles H.; Berlin, Lisa J. & Boris, Neil W. 2011. Practitioner review: Clinical applications of attachment theory and research for infants and young children. *Journal of Child Psychology and Psychiatry*, *52*(8), 819–833. doi: 10.1111/j.1469-7610.2011.02399.x

Zehr, Mary Ann. 2011b. Study stings KIPP on attrition rates. *Education Week*, *30*(27), 1, 24–25.

Zeifman, Debra M. 2013. Built to bond: Coevolution, coregulation, and plasticity in parent-infant bonds. In Cindy Hazan & Mary I. Campa (Eds.), *Human bonding: The science of affectional ties* (pp. 41–75). New York, NY: Guilford Press.

Zentall, Shannon R. & Morris, Bradley J. 2010. "Good job, you're so smart": The effects of inconsistency of praise type on young children's motivation. *Journal of Experimental Child Psychology*, *107*(2), 155–163. doi: 10.1016/j.jecp.2010.04.015.

Zentner, Marcel & Mitura, Klaudia. 2012. Stepping out of the caveman's shadow: Nations' gender gap predicts degree of sex differentiation in mate preferences. *Psychological Science*, *23*(10), 1176–1185. doi: 10.1177/0956797612441004.

Zhu, Qi; Song, Yiying; Hu, Siyuan; Li, Xiaobai; Tian, Moqian; Zhen, Zonglei, . . . Liu, Jia. 2010. Heritability of the specific cognitive ability of face perception. *Current Biology*, *20*(2), 137–142. doi: 10.1016/j.cub.2009.11.067.

Zhu, Weimo; Bolarskaia, Elena A.; Welk, Gregory J. & Meredith, Marilu D. 2010. Physical education and school contextual factors relating to students' achievement and cross-grade differences in aerobic fitness and obesity. *Research Quarterly for Exercise and Sport*, *81*(Suppl. 3), S53–S64. doi: 10.5641/027013610X13100547598584.

Zhu, Ying; Zhang, Li; Fan, Jin & Han, Shihui. 2007. Neural basis of cultural influence on self-representation. *NeuroImage*, *34*(3), 1310–1316. doi: 10.1016/j.neuroimage.2006.08.047.

Zhu, Zengrong & Huangfu, Danwei. 2013. Human pluripotent stem cells: An emerging model in developmental biology. *Development*, *140*, 705–717. doi: 10.1242/dev.086165.

Zieber, Nicole; Kangas, Ashley; Hock, Alyson & Bhatt, Ramesh S. 2014. Infants' perception of emotion from body movements. *Child Development*, *85*(2), 675–684. doi: 10.1111/cdev.12134.

Zimmer, Carl. 2009. On the origin of sexual reproduction. *Science*, *324*(5932), 1254–1256. doi: 10.1126/science.324_1254.

Zimmerman, Frederick J. 2014. Where's the beef? A comment on Ferguson and Donnellan (2014). *Developmental Psychology*, *50*(1), 138–140. doi: 10.1037/a0035087.

Zimmerman, Frederick J.; Christakis, Dimitri A. & Meltzoff, Andrew N. 2007. Associations between media viewing and language development in children under age 2 years. *The Journal of Pediatrics*, *151*(4), 364–368. doi: 10.1016/j.jpeds.2007.04.071.

Zimmerman, Marc A.; Stoddard, Sarah A.; Eisman, Andria B.; Caldwell, Cleopatra H.; Aiyer, Sophie M. & Miller, Alison. 2013. Adolescent resilience: Promotive factors that inform prevention. *Child Development Perspectives*, *7*(4), 215–220. doi: 10.1111/cdep.12042.

Zosuls, Kristina M.; Martin, Carol Lynn; Ruble, Diane N.; Miller, Cindy F.; Gaertner, Bridget M.; England, Dawn E. & Hill, Alison P. 2011. "It's not that we hate you": Understanding children's gender attitudes and expectancies about peer relationships. *British Journal of Developmental Psychology*, *29*(2), 288–304. doi: 10.1111/j.2044-835X.2010.02023.x

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bilingual schooling A strategy in which school subjects are taught in both the learner's original language and the second (majority) language.

binocular vision The ability to focus the two eyes in a coordinated manner in order to see one image.

Brazelton Neonatal Behavioral Assessment Scale (NBAS) A test often administered to newborns that measures responsiveness and records 46 behaviors, including 20 reflexes.

bully-victims People who attack others and who are attacked as well. (Also called *provocative victims* because they do things that elicit bullying.)

bullying aggression Unprovoked, repeated physical or verbal attacks, especially on victims who are unlikely to defend themselves.

bullying Repeated, systematic efforts to inflict harm through physical, verbal, or social attack on a weaker person.

C

carrier A person whose genotype includes a gene that is not expressed in the phenotype. The carried gene occurs in half of the carrier's gametes and thus is passed on to half of the carrier's children. If such a gene is inherited from both parents, the characteristic appears in the phenotype.

case study An in-depth study of one person, usually requiring personal interviews to collect background information and various follow-up discussions, tests, questionnaires, and so on.

centration A characteristic of preoperational thought in which a young child focuses (centers) on one idea, excluding all others.

cerebral palsy A disorder that results from damage to the brain's motor centers. People with cerebral palsy have difficulty with muscle control, so their speech and/ or body movements are impaired.

cesarean section (c-section) A surgical birth, in which incisions through the mother's abdomen and uterus allow the fetus to be removed quickly, instead of being delivered through the vagina. (Also called simply *section.*)

charter school A public school with its own set of standards that is funded and licensed by the state or local district in which it is located.

child abuse Deliberate action that impairs a child's physical, emotional, or sexual well-being.

child culture The particular habits, styles, and values that reflect the set of rules and rituals that characterize children as distinct from adult society.

child maltreatment Intentional harm to, or avoidable endangerment of, anyone under 18 years of age.

child neglect Failure to meet a child's basic physical, educational, or emotional needs.

child-directed speech The high-pitched, simplified, and repetitive way adults speak to infants and children. (Also called *baby talk* or *motherese.*)

childhood obesity In a child, having a BMI above the 95th percentile, according to the U.S. Centers for Disease Control's 1980 standards for children of a given age.

childhood overweight In a child, having a BMI above the 85th percentile, according to the U.S. Centers for Disease Control's 1980 standards for children of a given age.

chromosome One of the 46 molecules of DNA (in 23 pairs) that virtually each cell of the human body contains and that, together, contain all the genes. Other species have more or fewer chromosomes.

classical conditioning The learning process in which a meaningful stimulus (such as the smell of food to a hungry animal) is connected with a neutral stimulus (such as the sound of a tone) that had no special meaning before conditioning. (Also called *respondent conditioning.*)

classification The logical principle that things can be organized into groups (or categories or classes) according to some characteristic they have in common.

co-sleeping A custom in which parents and their children (usually infants) sleep together in the same room.

code of ethics A set of moral principles or guidelines that members of a profession or group are expected to follow.

cognitive equilibrium In cognitive theory, a state of mental balance in which people are not confused because they can use their existing thought processes to understand current experiences and ideas.

cognitive theory A grand theory of human development that focuses on changes in how people think over time. According to this theory, our thoughts shape our attitudes, beliefs, and behaviors.

cohort People born within the same historical period who therefore move through life together, experiencing the same events, new technologies, and cultural shifts at the same ages. For example, the effect of the Internet varies depending on what cohort a person belongs to.

comorbid Refers to the presence of two or more unrelated disease conditions at the same time in the same person.

concrete operational thought Piaget's term for the ability to reason logically about direct experiences and perceptions.

conditioning According to behaviorism, the processes by which responses become linked to particular stimuli and learning takes place. The word *conditioning* is used to emphasize the importance of repeated practice, as when an athlete *conditions* his or her body.

conservation The principle that the amount of a substance remains the same (i.e., is conserved) even when its appearance changes.

control processes Mechanisms (including selective attention, metacognition, and emotional regulation) that combine memory, processing speed, and knowledge to regulate the analysis flow of information within the information-processing system. (Also called *executive processes.*)

conventional moral reasoning Kohlberg's second level of moral reasoning, emphasizing social rules.

copy number variations Genes with various repeats or deletions of base pairs.

corporal punishment Punishment that physically hurts the body, such as slapping, spanking, etc.

corpus callosum A long, thick band of nerve fibers that connects the left and right hemispheres of the brain and allows communication between them.

correlation A number between +1.0 and −1.0 that indicates the degree of relationship between two variables, expressed in terms of the likelihood that one variable will (or will not) occur when the other variable does (or does not). A correlation indicates only that two variables are somehow related, not that one variable causes the other to occur.

cortex The outer layers of the brain in humans and other mammals. Most thinking, feeling, and sensing involves the cortex.

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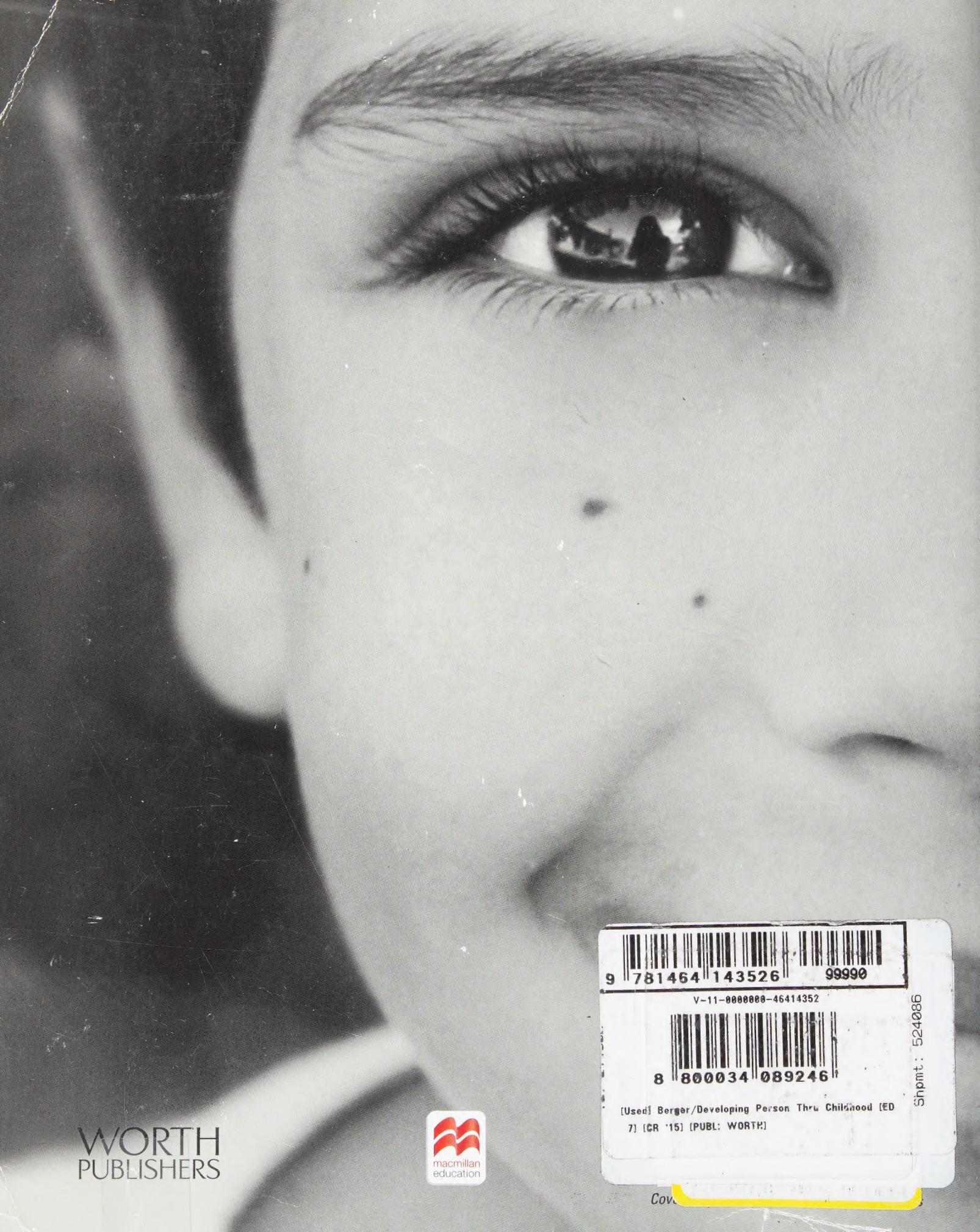
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WORTH
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education

9 781464 143526 99990
V-11-0000000-46414352
8 800034 089246
[Used] Berger/Developing Person Thru Childhood [ED 7] [CR '15] [PUBL: WORTH]
Shpmt: 524086